

Cost efficient regulation of Danish agricultural greenhouse gases through taxation

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Recently, the EU countries have agreed upon national greenhouse gas (GHG) emission reduction targets for the sectors that fall outside the scope of the EU Emissions Trading System (ETS). These sectors include transport, buildings and agriculture. Denmark must reduce emissions from these sectors by 39 pct. in 2030, compared to 2005.

In contrast to most other Danish sectors outside the ETS, there is currently no direct regulation of GHG emissions from the Danish agricultural sector. In theory, cost-efficient GHG reductions require direct emission taxation. This is not feasible in practice in the agricultural sector. We propose an alternative, where emission-inducing activities are taxed. We model the societal costs and effects on emissions related to such a scheme. The modeled tax scheme includes differentiated taxes on livestock units, on fertilizers and on the cultivation of crops. This is done by combining a partial equilibrium model of different Danish farm types (ESMERALDA) with detailed geographic information about the prevalence of these farm types.

We find that, using the agricultural emissions tax scheme outlined above, there are cheap reductions to be achieved in agriculture, compared to other sectors not covered by the ETS. This suggests that such a scheme could help achieve cost-efficient achievement of the reduction target assigned to Denmark by the EU.

The impacts of the proposed agricultural taxation scheme would vary widely between different types of farms. Dairy farmers would have to pay relatively high taxes, as cows emit more greenhouse gases than other types of livestock. We show that these effects can partially be mitigated by a non-distorting transfer of the resulting tax revenue to farmers.

The activities that cause agricultural emissions of nitrogen and GHG's overlap to a large extent. Therefore, reducing the agricultural emissions of nitrogen would also lead to a reduction in the emissions of greenhouse gases from agriculture. We argue that the proposed tax scheme on agricultural activities that emits greenhouse gases can relatively easily be extended to include other types of emissions such as nitrogen. Danish implementation of the EU Water Framework Directive has been translated into a set of geographically differentiated reduction targets for nitrogen loads to coastal waters and groundwater. We find that, in meeting these nitrogen targets, the agricultural emission of greenhouse gases would be reduced by up to two million tonnes of CO₂-equivalents. Fulfilment of the EU Water Framework Directive may, therefore, imply that there is only a modest need for further reductions in the Danish non-ETS sector in order to reach the target of reducing the emissions by 39 per cent by 2030 compared to 2005. Even though the estimate of the effect of fulfilling the Water Framework Directive is quite uncertain, the results illustrate that the level of nitrogen regulation is likely to have a big impact on the total emissions of greenhouse gases.

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