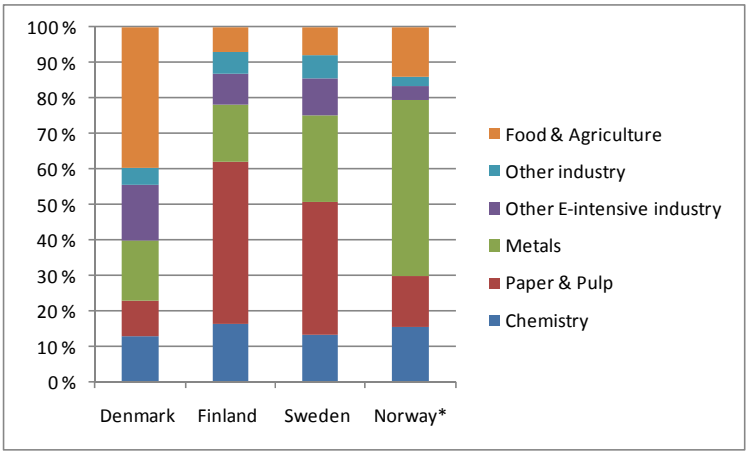
Nordic industries in a global context

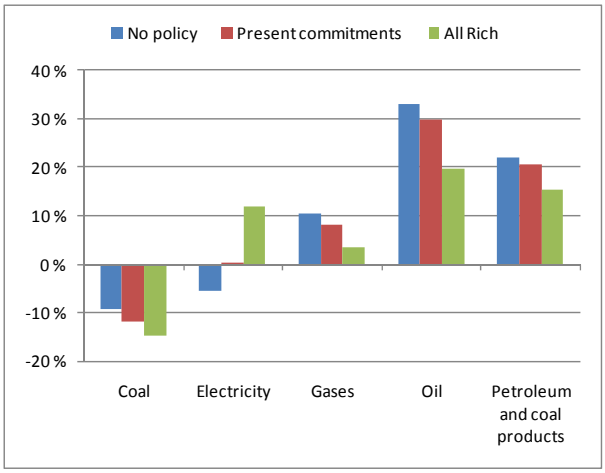
Industries in the Nordic Countries are among the most energy-intensive in the world due to the large shares of forest, metal and chemical industries in the total production. In Finland, Sweden and Norway, these sectors account for 75 to 80% of the total electricity consumption, as illustrated in the figure. Denmark, however, has clearly less energy-intensive industry than the other Nordic Countries, reflected in the high share of food and agriculture production. In Finland and Sweden, paper and pulp industries are clearly the largest energy users, whereas in Norway, metal and mineral industries consume half of the total electricity used in primary and manufacturing production.



Total electricity use in industry in the Nordic countries. Figure presents the shares of each industry sector of the total industrial electricity consumption in the base year 2001 (primary and manufacture product; services and energy production (?) are not included). (data: GTAP database)

Increasing energy use and price

In the GTAP model simulations for the period from the base year (2001) until 2020, a considerable increase in the global energy consumption is observed. The simulations include a "no-policy" reference case, where there are no international climate policies in place and thus a very high energy use growth rates are observed. In addition, different emission reduction policy scenarios for the developed world regions are also simulated.

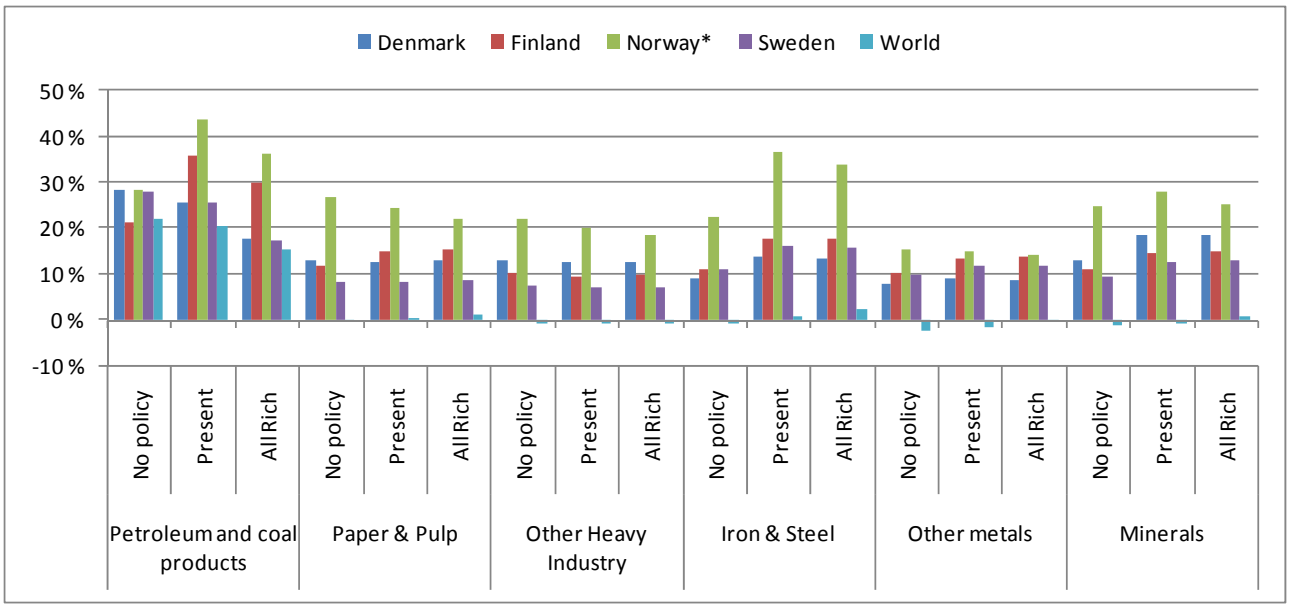


The figure on the left shows the generally increasing trend in oil and gas prices, whereas coal price is decreasing. As expected, the pre-tax world market price is the highest when there are no climate policies, because the CO_2 tax increases the final price paid by industries and consumers, hence lowers the demand, which in turn causes the supply prices to also decrease. The red bars show the results with EU's present climate policy commitments and emission trading scheme, whilst the green bars represent a more ambiguous policy including all rich countries. The higher the reduction targets are and the more countries involved, the lower primary energy prices before taxes would be. World average electricity prices develop the opposite way, as the CO_2 tax is included in the primary energy prices paid by electricity producers.

World energy commodity prices: %-change 2001-2020

Nordic energy-intensive industries

As illustrated in the following figure, the *local* supply prices of many industries important to the Nordic countries increase under all the scenarios in the period 2001-2020, whilst the world market price of these commodities remains virtually unchanged. This implies that whilst the production may become more expensive, the income earned at world market does not increase at the same proportion. Therefore, especially export-oriented energy-intensive industries are, on one hand, becoming less advantaged compared to the foreign (often Chinese or Indian) competitors and, on the other hand, less profitable use of available production factors compared to other domestic industries. However, such development is largely offset by overall growth of industrial output, which stays around 2% per annum in all the scenarios.

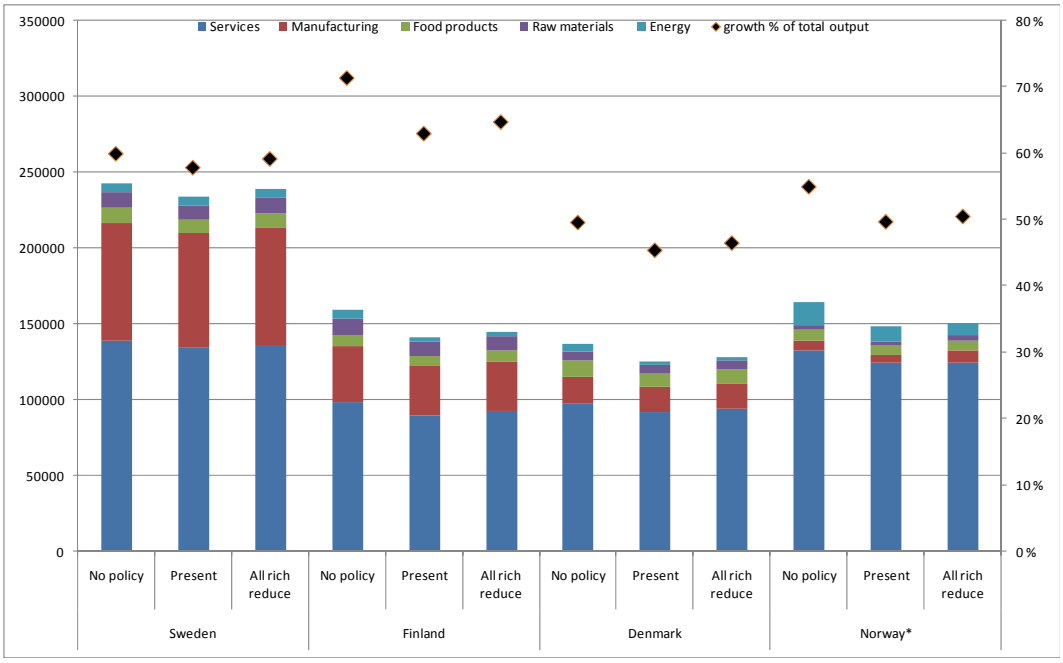


Supply prices for selected industries, %-change 2001-2020, Nordic Countries and World.

In Sweden, the overall results are similar in all three simulations. The EU emissions reduction policies trigger only minor decrease in overall industry output growth, and inclusion of other rich countries results in almost the same growth figures as in the no-policy scenario. This suggests that the Swedish energy sector is able to switch to less emissions generating production with relatively low extra costs, which gives an additional comparative advantage to energy-intensive industries.

In Finland, the impacts of emissions reduction policies are clearly more visible. However, the Finnish overall industry output growth rate is the highest of all the Nordic countries in all the above scenarios, though the difference is smaller in the scenarios with climate policies. A closer look at industry-specific results indicate that the main difference between simulations comes from Paper and Pulp sector, where the supply price grows clearly more with climate polices, unlike in other Nordic countries.

In Norway, the results have two main directions. First, a development similar to Sweden can be observed with regard to energy-intensive industries, as Norwegian electricity production has the advantage of using very small amount of CO_2 emitting fuels. Second, Norway's petroleum sector follows the developments of world oil price. (The GTAP model is built on the premise that each country's trade balance always is zero. This implies that today's Norwegian oil policy, where the oil surpluses are investested in fonds abroad, is not modelled. The lower oil prices in "Present" and "All Rich" implies a depreciation of the NOK in the model, which gives the electricity intensive industry a comparative advantage.)



Output growth in industry and service sectors n the , Nordic Countries. The bars show the difference between 2001 and 2020 levels and its composition by sector, measured in thousands of 2001 US dollars. The black diamonds indicate the percentage growth of total manufacturing output compared to 2001 level. Results are given for simulations with no emissions reduction policies, with current EU commitments, and with more ambitious targets for all rich countries.
(figures for Norway include Iceland)*