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Smooth Transition to Low Carbon World with Optimal Policies for Natural Gas and Renewable Energies

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Overview

Both the threat of global warming and peak oil drive the transition to renewable energies. While EU policy targets of 20-20-20 are correct and feasible, the transition brings high extra cost. One is related to very high subsidies on renewable energies instead of subsidizing R&D on their cost reduction. Another is dysfunction of natural gas plants in electricity production that were designed to combat global warming using relatively abundant fossil fuel during the transitory period.

Establishing carbon tax on such level along with reduction of subsidies for renewable can generate smother and less costly transition to EU policy objectives, If collected taxes are distributed to consumers to compensate for some increase in equilibrium price for electricity, income effect can be practically eliminated. Natural gas will substitute coal in electricity, cost (and hence price) of electricity will increase, but then onshore wind does not need subsidy anymore, while subsidy for PV can be reduced.

Methods

The approach is analytical and is based on policy objective, cost structure analysis and suboptimality of choices driven by the current market structure. A special attention is devoted to the forecast of the future behavior of natural gas prices in Europe.

The rational policy objective for EU should be not to simply reach the targets of carbon emission reduction and the fraction of renewable energies but to do it at the minimal cost along the trajectory. It is allowed to have some deviations from the dynamic target at a certain cost, but in fact, the dynamic target of growing share of renewable and reduction of carbon emissions is even not specified for every year. Thus, the key element of the analysis is to find what reduction can be reached at what cost.

Results

The major trade off is between the dynamics of share of natural gas and renewable energies in energy portfolio. The current market conditions with failed market for carbon dioxide in EU and relatively low prices for coal comparing to natural gas drive out gas from electricity production. Thus, the objective of reduction of carbon emission has to be reached via higher fraction of renewable energies. The present policy to subsidize photovoltaics (PV) and wind (instead on investment in R&D to reduce their costs) brings a lot of additional expenditures. Especially taking into account the necessity to balance random energy supply from solar and especially wind plants with conventional producers of electricity (including coal and gas fired plants.

As for the prices of natural gas, there are no reasons to expect their substantial reduction in the coming decade. American shale gas can reach EU not earlier than in 2018, in moderate volumes and with prices close to current, because liquefaction and transportation is costly. The new gas fields being developed in the coming years are not expected to be cheap either. If no positive shock for coal price would occur, gas powered plants would remain non-competitive unless carbon tax of 30-50 euro per ton is introduced.

Conclusions

Let us consider the costs and benefits of moving to this price set by some European decree (if markets failed to do that). Electricity will become more expensive, but the revenue from carbon tax can be distributed among consumers of electricity as a lump sum, or in the form of lower income taxes. Clearly, owners of coal plants will get lose, but investors of existing gas plants will stop losing. The average loss of businesses is expected to be close to zero. So far the government and society has not won any money (except for reaching social objective to make less carbon emissions).

But here comes the policy to subsidize renewable energies. It was suggested that onshore wind would need carbon price of about $50 to become competitive, while offshore wind and photovoltaics (based on best German technology) would need some prices close to 100 $/ton to become competitive. At the new prices for electricity onshore wind becomes competitive, while the required subsidy for offshore wind and PV can be reduced by 50 %, and this will make real economic savings.

Another negative effect of current policies is due to Green Paradox. Subsidies to renewable lower the demand for fossil fuels thus making them cheaper so that the necessary subsidy might grow to infeasible level.

Literature

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