



Sweden has long been hailed as a leader in sustainability, which might be attributed to strong environmental policy decisions. But is this really the case, and if so, how do these policies designed to foment environmental efficiency work? A research team affiliated with the Centre for Environmental and Resource Economics (CERE) has been investigating such questions by examining the effects of national and European climate policies on the performance of Swedish manufacturing firms

# Sustainable Sweden – how Swedish business responds to climate policies

The EU is promoting an encouraging range of climate policies, including the Emission Trading System (EU-ETS), and on a national level several countries have imposed some kind of CO<sub>2</sub> tax. But despite the undisputable benefits of such policies, there is little consensus about the costs to industry – the bottom line for everyday decision-making. A 2011–2013 research project commissioned by the Swedish Energy Agency – a joint venture between Sweden’s Umeå University and the Swedish University of Agricultural Sciences (SLU) – used state of the art economic analysis to study the direct impacts of energy and climate policy on firms’ financial and environmental performance.

The team of six researchers includes international collaborators from Oregon State University as well as the core CERE group, who work together on a daily basis. Head of the group Tommy Lundgren has a long-standing interest in applied policy analysis, and jumped at the opportunity to contribute to the increasingly important area of sustainability in industry. The

policy design process, particularly in the previously untrodden territory of climatic change, urgently needs knowledge input to produce sound climate legislation, which Lundgren hopes this research will help facilitate.

Lundgren, alongside Per-Olov Marklund, provided the research direction and ideas while performance measurement experts Rolf Färe and Shawna Grosskopf at Oregon State assisted with the theoretical modelling. The dataset is a detailed firm-level panel from 1990–2008, incorporating accounts, emissions, environmental investments, energy use, and other policy and economic variables for basically all Swedish manufacturing firms (including mining).

The results are mostly encouraging, finding that average environmental performance – measured as carbon intensity of production – increased by 40% from 1998 to 2004 among Swedish firms, in part as a result of the CO<sub>2</sub> tax. The tax’s effect on profitability was ambiguous – though neutral or negative in most cases, it also

prompted a tendency in the least energy-efficient firms and sectors to improve energy efficiency, and thus overall efficiency, in response. Thus, the so-called Porter hypothesis – both environmental and economic performance increase as a result of environmental policy – can be corroborated for a few sectors, but not for most of them.

The analyses also found that market-driven improvements in environmental performance, often referred to as corporate social responsibility, tended to enhance firms’ efficiency and thus business performance. Moreover, results also show that the EU-ETS had small or insignificant effects on technological development, demonstrating that ETS permit prices were likely too low to spur investments in efficiency-improving technologies.

Another interesting result is that the theoretical modelling of a production process involving a pollutant is crucial to the outcome of the analysis. For example, the common practice of treating biofuels as entirely carbon-neutral – when in fact their

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combustion does release carbon emissions that take time to be absorbed back into growing biomass – tends to overestimate the potential for CO<sub>2</sub> reduction, which can lead to misleading policy implications.

The data does not encompass the financial crisis years, “but we are working on updating the data in some directions,” says Lundgren. The crisis slowed down economic activity, which in turn lowered emissions, meaning the price of ETS permits fell sharply and pressure to improve environmental performance has weakened since 2008. “Also, in a time when firms are struggling for survival, the focus is not on investing in green technology,” he adds.



Although Swedish industry has undoubtedly come a long way in reducing air emissions, there is still room for improvement. But policy implications are generally positive; the CO<sub>2</sub> tax in Sweden significantly impacted industrial emissions, improving the carbon performance of production. “This shows that environmental policy has an impact and that it really works,” Lundgren says. “We see a clear decoupling between emissions and economic performance since 1990 – carbon policy has the potential to significantly lower emissions without necessarily hampering competitiveness.”

This is good news for countries currently developing their climate policy, as the results and methods can be applied to other countries with similar institutions and industry structure. CERE’s approach, looking at the whole performance chain – economic, energy and carbon performance all together – has drawn a lot of interest, and the studies have the potential to influence policy analysis in fields relating to climate and industry. “It’s important to measure actual performance and not rely too much on scores and rankings, as is common in CSR studies, which can be very subjective and misleading,” says Lundgren.

“Many of our results will be relevant for the post-2020 climate discussions, such as the 2030 goals to reduce emissions by 40% and attain 27% renewables – and in the longer run the 2050 agenda.”

As ever, answers raise further questions. “We have shown that energy use is critical to environmental performance, but research into energy efficiency and its determinants is still quite underdeveloped,” says Lundgren. “There is some research from the engineering field, but very little from the perspective of social science and economics.” Consequently, the team will not only tie off this research chapter with a book published later this year (Taylor

and Francis, Routledge), but also begin a new project. ‘Industrial energy use and energy efficiency in Sweden’ will take a balanced view of energy efficiency, considering it in the context of sector-specific technologies and other inputs, rather than just targeting energy intensities, and aims to analyse influences on industrial energy consumption, efficiency, mix choices and substitutions.

Energy, carbon and climate issues will only become more relevant in the future, but the path to cleaner technologies is not necessarily easy. Sweden’s power infrastructure is around 96% carbon-free, including nuclear – but in the short term, replacing old nuclear plants will become a pressing issue, and market forces rule.

“There is no doubt that a higher international carbon price, either via tax or cap-n-trade, would help development of cleaner technologies worldwide,” says Lundgren. “But it would still not eliminate fossil fuel consumption completely; relatively cheap and abundant oil, coal and gas are the major factor holding back alternative technologies. As long as fossil fuels are easy and not too costly to supply they will be consumed somewhere – if not in Europe, then in other parts of the world.”★

## AT A GLANCE

### Project Information

**Project Title:**

The impact of energy and climate policy on sustainability and competitiveness in Swedish industry

**Project Objective:**

The objective of this project has been to study economic and environmental performance in Swedish industry in relation to environmental/climate and energy policy. To this end we used a detailed panel data set with information related to firm level economic, environmental, policy, and energy variables between 1990 and 2008.

**Project Duration and Timing:**

2011 – 2013 (3 years)

**Project Funding:**

Swedish Energy Agency (~720 000 EURO)

**Project Partners:**

Core group: Tommy Lundgren, Per-Olov Marklund, Zhou Wenchao. International collaborators: Rolf Färe and Shawna Grosskopf, Oregon State, USA.

## MAIN CONTACT

**Tommy Lundgren**

Tommy Lundgren’s research is mainly focused on applied policy analysis related to the environment. He has published in top tier journals within his field such as Energy Economics, Land Economics, and Environmental and Resource Economics. Currently he is running a project assessing industrial energy demand and energy efficiency in Sweden.

**Contact:**

**Tel:** +46 70 517 4396

**Email:** [tommy.lundgren@usbe.umu.se](mailto:tommy.lundgren@usbe.umu.se)

**Web:** [www.cere.se](http://www.cere.se)

