Centre for Climate Change Economics and Policy

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Grantham Research Institute on Climate Change and the Environment

Submission to the consultation by the Department for Energy and Climate Change on ensuring regulation encourages innovation

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Policy paper

February 2016

ESRC Centre for Climate Change Economics and Policy

Grantham Research Institute on Climate Change and the Environment

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The Centre for Climate Change Economics and Policy (CCCEP) was established in 2008 to advance public and private action on climate change through rigorous, innovative research. The Centre is hosted jointly by the University of Leeds and the London School of Economics and Political Science. It is funded by the UK Economic and Social Research Council. More information about the ESRC Centre for Climate Change Economics and Policy can be found at: http://www.cccep.ac.uk

The Grantham Research Institute on Climate Change and the Environment was established in 2008 at the London School of Economics and Political Science. The Institute brings together international expertise on economics, as well as finance, geography, the environment, international development and political economy to establish a world-leading centre for policy-relevant research, teaching and training in climate change and the environment. It is funded by the Grantham Foundation for the Protection of the Environment, which also funds the Grantham Institute for Climate Change at Imperial College London. More information about the Grantham Research Institute can be found at: http://www.lse.ac.uk/grantham/

Submission to the consultation by the Department for Energy and Climate Change on ensuring regulation encourages innovation

1. This is a submission by the ESRC Centre for Climate Change Economics and Policy and Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science (LSE) to the Department of Energy and Climate Change's consultation on 'Ensuring regulation encourages innovation'.

2. The consultation document solicits responses from stakeholders on three questions:
    - How can legislation and enforcement frameworks help support new technologies and business models to encourage growth?
    - How is new technology likely to shape the energy sector?
    - How can regulators better utilise new technologies to generate efficiency savings and reduce burdens on business?

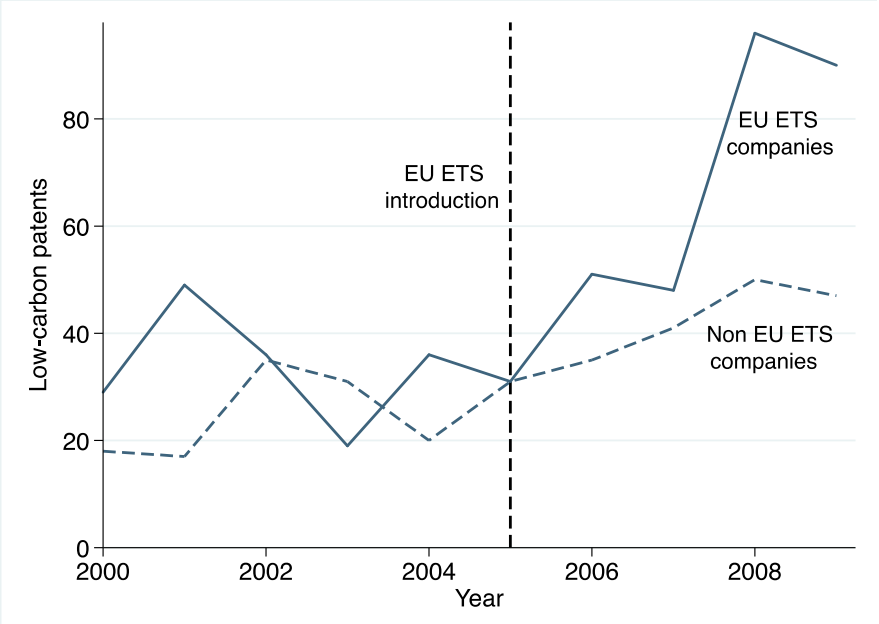
3. It also invites general views on the overall theme. It offers feedback on the consultation first question **'How can legislation and enforcement frameworks help support new technologies and business models to encourage growth?'** and provides some broader insights on the theme of low carbon innovation based on the research by the Institute.

Question 1: 'How can legislation and enforcement frameworks help support new technologies and business models to encourage growth?'

4. Evidence shows that policies that put a price on carbon (directly through emissions trading systems and carbon taxes, or indirectly through energy efficiency mandates) are a crucial driver for the adoption of environmentally friendly technologies and induce innovation.

5. The impact of policies appears both large and rapid. Evidence from the European Union Emissions Trading System (EU ETS) shows that firms inside and outside the carbon market exhibit roughly comparable innovation activity (measured by number of low-carbon patents filled) before the introduction scheme, but that it diverges quickly afterwards, with companies regulated under the EU ETS filing a larger number of low-carbon patents (see Figure 1).

Figure 1. Low carbon innovation activity of EU ETS regulated companies



Source: Dechezleprêtre et al., 2016

6. Evidence also shows that the UK's program to fast track low-carbon patents, which began in 2009, was successful in promoting the diffusion of low-carbon technologies (Dechezleprêtre, 2013). The participation rate in the UK was high (20 per cent of total green patents filled) compared to other schemes in Canada, Australia, Japan, Korea (between 1 and 2 per cent of green patents filled), the US (8 per cent) and Israel (13 per cent). The scheme also reduced the time for granting patents by 75 per cent. This is very high compared to other schemes (see table 1 below).

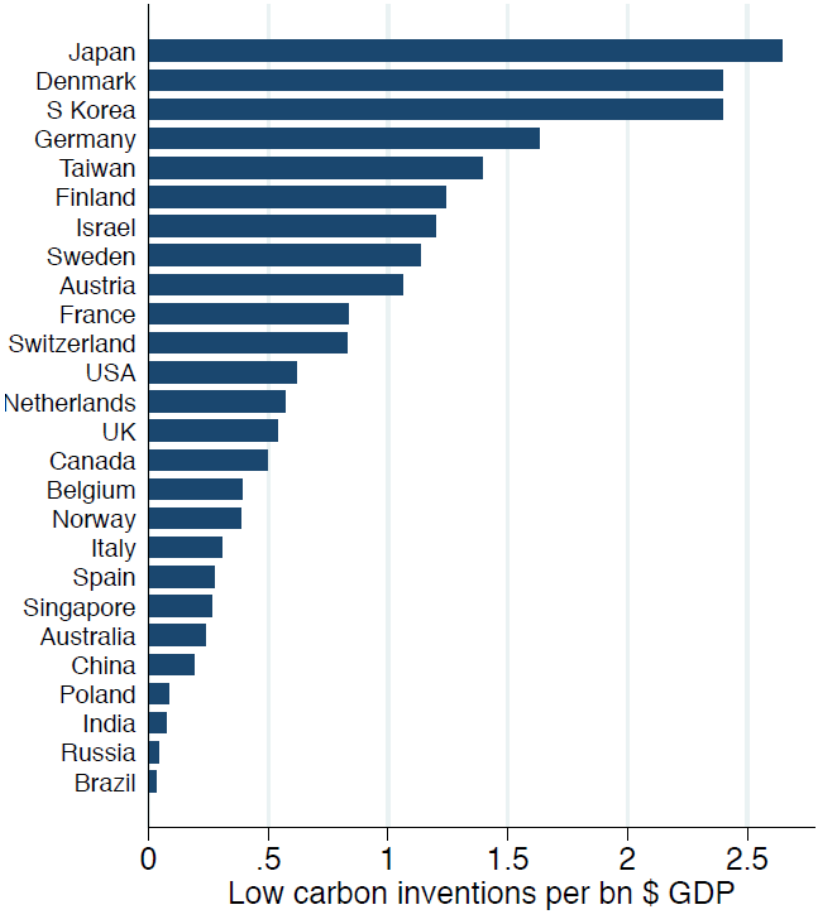
Table 1: Time–to-grant for fast-track programmes compared with the regular examination process

Country	All patents	Fast-track patents	Reduction in time-to-grant
Australia	3.7 years	1.9 years	49%
Canada	7.8 years	2.5 years	68%
UK	3.3 years	0.8 years	75%
US	2.8 years	1.6 years	42%
Israel	5.4 years	2.8 years	48%

Source: Dechezleprêtre, 2013

However, ranking OECD countries on the number of low-carbon inventions they currently generate per billion dollars of GDP, the UK is approximately midway, suggesting more ambitious policy and regulation to drive innovation is required (see Figure 2).

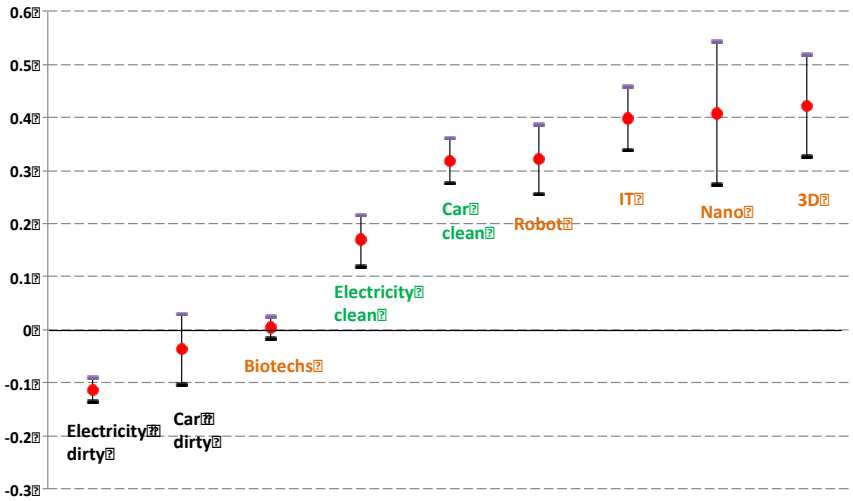
Figure 2. Number of low-carbon inventions per bn $ GDP 2010-2014



Source: Dechezleprêtre et al., 2016

7. Low-carbon innovation has larger economic benefits than innovation in other technologies**.** Recent evidence shows low-carbon innovations in the energy and transport sectors generate more technological improvements in other sectors of the economy than innovations in high-carbon energy and transport, i.e. they have a much higher knowledge spillover effect. Figure 3 shows that the spillover effect in low-carbon innovation is of a similar order to other emerging technologies such as IT and nanotechnology. These results suggest that switching innovation activities from high-carbon to low-carbon technologies can help to offset the costs of climate change regulations and even encourage economic growth.

Figure 3. Clean and dirty spillovers versus other emerging fields



Note: The figure compares the intensity of knowledge spillovers (as measured by patent citations) in a number of technologies, compared to the average patented technology. The y-axis represents the percentage difference in the intensity of knowledge spillovers. For example, a value of 0.2 means that the technology induces 20 per cent more knowledge spillovers than the average patented technology. Red dots are point estimates; the black lines show 95% confidence intervals. Source: Dechezleprêtre et al. (2014)

8. Europe as a whole retains 61 per cent of the spillover benefits from its low-carbon innovation activities. However, individual countries like the UK, often with more open economies, tend to retain less than average. For example the UK retains 17 per cent, France retains 25 per cent and the Netherlands 10 per cent. As such, coordination of European Union research policy appears justified and there is a strong case for European institutions – such as the European Research Executive Agency, the European Research Council or the Innovation and Networks Executive Agency – to fund R&D, just like public R&D in the United States is funded by the federal government rather than by individual states.

General views:

9. While regulation placing a price on carbon is clearly an important driver of innovation, it tends to favor technologies that are close to the market. Thus, regulation needs to be complemented by direct support for emerging technologies that will be essential to meet long-term emissions reduction targets. Support for emerging technologies could come via increased public funding for R&D or via policies such as feed-in tariffs.

10. Current deployment efforts should be augmented with additional R&D support, such that the marginal pound spent on low-carbon technologies should go to R&D rather than deployment. European countries, including the UK, have been focusing on technology deployment through feed-in tariffs for renewable energy production rather than through direct R&D support, but this approach may not provide sufficient stimulus to develop the next generation of low-carbon technologies. From a political point of view, an additional advantage of direct support to R&D is that it is targeted at domestic manufacturers, while feed-in tariffs may encourage innovation activity also in foreign countries.

11. Public spending on low-carbon R&D needs to increase significantly over the next few decades if the world is to realise the goals of the Paris Agreement to limit global warming to well below 2°C and to achieve net zero global emissions of greenhouse gases in the second half of this century. It is difficult to give a precise figure for increased public investment, but the literature agrees that it should at least double. Some of the greatest funding increases are needed in low-carbon transportation, carbon capture and storage (CCS), smart grids and industrial energy efficiency.

12. In Europe, a doubling of public R&D expenditures in low-carbon technologies over the next 10 years (from €4bn to €8bn a year) corresponds to the growth in low-carbon public R&D expenditures that was observed between 2001 and 2011 and thus seems achievable. Assuming an average carbon price of €11 per tonne, a doubling of public R&D funding for low-carbon technologies represents only 10 per cent of the expected revenues from auctioned emissions allowances over the next decade.

13. Increased investment in low-carbon R&D should be slow and sustained. While it is welcome that countries such as the UK have committed to doubling public funding for low-carbon R&D by 2020 as part of 'Mission Innovation'; countries should be encouraged to set public R&D targets as far ahead as 2030. Targets would vary between countries and may need to be set within a range, but such long-term targets would reduce public funding spikes and associated adjustment costs, and ultimately could reduce the overall cost of decarbonisation.

References

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