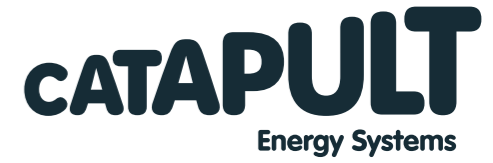


# Carbon Policy and Economy-Wide Productivity

## Future Carbon Policy for Clean Growth



Energy Systems Catapult's 'Rethinking Decarbonisation Incentives' (RDI) is taking a fresh whole systems perspective on carbon policy. We use "carbon policy" as a shorthand for a wide set of policies (including taxes, subsidies, and regulations) that create economic incentives to reduce greenhouse gas emissions.

The UK has reduced emissions by 42% since 1990 while the economy has continued to grow, but productivity has stagnated. Through the Industrial Strategy and The Clean Growth Strategy the UK Government has clearly acknowledged the relationship between productivity and carbon policy (e.g. the introduction of the Emissions Intensity Ratio). However, clear articulation of how carbon policy is linked to productivity is missing, but such a framework would help guide policy decisions.

Greenhouse gas emissions are currently largely unpriced/underpriced in productivity measurements, which focuses on GDP per capita or per hour worked. Therefore, the benefit of emissions reduction (i.e. less damaging, higher quality goods and services) is not fully reflected in official statistics. A more complete measurement of productivity would provide more accurate signals to help improve future productivity by directing money, jobs and efforts into sectors most likely to grow.

We have explored the links between carbon policy and economy-wide productivity and we conclude what the evidence suggests for policy.

### What does the literature say?

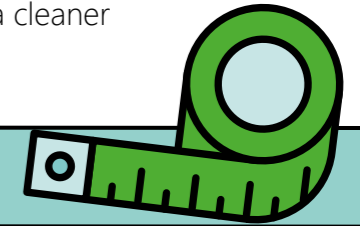
Below is a summary of evidence from the literature review in relation to four research questions:

Research Questions	Summary of Evidence
Through what mechanisms do carbon policies influence productivity?	<ul style="list-style-type: none"> <li>Theoretical effect is ambiguous.</li> <li>Compliance costs reduce productivity as resources are diverted away from production. However, regulations may improve productivity if firms are not already optimising.</li> <li>If innovation is induced, productivity could improve.</li> </ul>
Does the choice and design of carbon policies affect the capacity of the economy to innovate?	<ul style="list-style-type: none"> <li>Strong evidence that market-based policies are associated with increases in innovation ('narrow' Porter Hypothesis).</li> <li>Good evidence that strategic investment by government is associated with more innovation.</li> <li>More ambiguous on the impacts of standards and engagement.</li> </ul>
Does the choice and combination of carbon policies have any particular implications for productivity over time?	<ul style="list-style-type: none"> <li>Substantial literature demonstrating that increases in innovation are associated with improved productivity.</li> <li>Literature linking carbon policy and productivity directly is less available and very context-specific.</li> <li>Literature generally finds small positive effects of market-based policies and less clear results of other types of carbon policy.</li> </ul>
How important, in productivity terms, is it to have a coherent set of economic carbon abatement drivers and how could this be measured or quantified?	<ul style="list-style-type: none"> <li>Most of the literature uses micro-data linking very specific policies to firm-level outcomes.</li> <li>Very difficult to extrapolate to the macroeconomic effects from this, but the few studies that exist suggest small positive effect of up to 5% of productivity growth.</li> </ul>

### Conclusions

The findings of the literature review lend themselves to three conclusions for policy, which bring policy design and productivity measurement to the forefront of the debate about how to ensure carbon policy supports and enhances productivity growth.

**1 Policy needs to be informed by a more complete measurement of productivity.**  
Traditional productivity measurement does not account for the positive value of output produced with lower emissions. In effect a cleaner economy is also a more productive economy.



**2 Carbon pricing and environmental standards help drive innovation in the production of less damaging outputs.**  
The appropriate policy and length of time to deliver new innovation will vary from sector-to-sector, but the existing evidence suggests a strong link between the two.

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**3 Carbon policies need to adapt to the specific context to improve aggregate productivity.**  
The evidence suggests that how a policy is designed and implemented matter more for its success as the initial choice of policy instrument. Factors such as the credibility and stability of a policy are likely to be as important as the type of policy.



As part of the RDI project, we have previously explored:

- summarised the 'effective carbon prices' in different UK sectors
- explored policy approaches to decarbonisation in 11 countries to help inform thinking about UK policy options
- formulated a selection of possible policy reform options to incentivise emission reductions across the UK economy
- explored the issues and challenges associated with policy mechanisms to deliver climate mitigation in the agriculture, forestry and other land use (AFOLU) sectors