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Low carbon innovation and enterprise growth in the UK: Challenges of a place-blind policy mix

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ABSTRACT

This paper uses a policy mix approach to examine the institutional and governance issues arising from the UK's support for innovation in low carbon manufacturing sectors. The paper draws on interviews with managers of small and medium-sized manufacturing enterprises as well as policy practitioners and industry experts. The analysis of these interviews highlights issues in the multi-scalar design and delivery of these policies, including gaps and tensions in the policy mix, as well as the importance, and relative neglect of, regional institutional entrepreneurship in driving change. We find that coherence and consistency in UK low-carbon innovation policy is lacking, which is creating uncertainty and hampering private sector investment. The loss of regional capacity and anchor institutions challenges local and national actors to leverage instruments and connections but with much depleted resources, lacking a clear mandate, and facing a fragmented intermediary and support landscape.

1. Introduction

Low carbon and environmental sectors are those "contributing to prevent, measure, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems" and include cleaner production technologies, products and services that reduce environmental risk and minimise pollution and resource use (OECD and Eurostat, 1999). Policies to support these sectors are a frequent feature not only of sustainable development policies initiatives but also growth strategies in countries and regions across the globe. Innovation in these economic sectors is seen as key in resolving the 'trilemma' of affordability, security and sustainability of energy supply as well as maximizing opportunities to grow low carbon economies. However, stimulating low carbon innovation is invariably complicated, with multiple facets that require coordination including policies for energy generation and transmission, pricing, regulation, pollution, land-use, technology, industry, competition, and regional development (OECD, 2015).

This paper examines institutional, governance and policy mix issues arising from the UK's support for innovation in firms that manufacture low carbon products, namely those that have environmental, low carbon, or natural resource benefits. Following the 2008 Climate Change Act, the UK established a path to deliver ambitious low carbon targets by 2050. Since 2010, this strategy has been set within a context of austerity measures and within a broader 'rebalancing' growth agenda seeking to promote sectoral diversification, overcome regional disparities, and ensure a more resilient path for economic recovery and sustainable growth (HM Treasury/BIS, 2011). At the same time, in England such objectives have been pursued against a backdrop of radical shifts in the governance of regional policy, with the management of innovation policy concentrated back at the national level albeit with some reassignment of limited economic development powers in England from the regional to the local level. Effectively, what has emerged, particularly in England, is a largely centrally-controlled mix of policies for supporting low-carbon industry innovation with weak capabilities to coordinate, let alone vary, those policies to address regional and local needs and opportunities. We seek to explore what effect this current 'place-blind' approach has on companies engaged in various low-carbon industry sectors.

The paper draws from document analysis and interviews with managers of manufacturing small and medium-sized enterprises (SMEs) in low-carbon and environmental sectors, as well as policy practitioners and industry experts. It examines firms' perception of the policies to stimulate innovation in low-carbon industries and critically assesses the governance and institutional setting of UK support to the sector. The paper draws conclusions in relation to the multi-scalar design and delivery of these policies, including gaps and tensions in the policy mix, as well as the importance of, and relative neglect of, regional institutional entrepreneurship in driving change.

The paper is structured as follows. The first part introduces the rationales for policy intervention to support low carbon innovation and discusses the configuration of policy instruments as well as the

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main defining elements and features of policy mixes. The third section in turn introduces the UK policies in supporting innovation in for low carbon and environmental sectors, before providing a critical assessment in terms of the balance, coherence, stability and consistency of these interventions in section four. The final section draws broader conclusions and implications.

2. Green innovation policies: a policy mix view

The development and diffusion of low carbon innovation is seen as indispensable to solve or at least abate an environmental/energy crisis (Gross and Foxon, 2003) Policy intervention to support emerging clean technologies is generally justified on the basis of a double externality problem (Rennings, 2000), which reduces the incentives for firms to invest in them. First, there are negative externalities associated with unpriced carbon emissions. Second, there are the more general externalities and risks associated with innovative activity (given its characteristics of non-rivalry and non-excludability). These market failures are used to justify the use of innovation policies to reduce technology costs, in coordination with environmental policies directed at internalizing external costs associated with less sustainable technologies.

Besides market failures, clean technologies often face multiple systemic and institutional failures (Bleda and del Río, 2013; Foxon et al., 2005; Rip and Kemp, 1998; Unruh, 2000), including barriers to adoption, switching costs, and insufficient network effects, and thus their adoption requires organizational and institutional change. A challenge is thus how to avoid carbon lock-in (Unruh, 2000) and facilitate transitions towards more sustainable 'regimes' (Geels, 2002; Markard et al., 2012; Smith et al., 2010) by nurturing and scaling up alternative technological niches that are not yet sufficiently competitive or proven.

Sustainability transitions are institutionally but also geographically embedded (Truffer and Coenen, 2012). The role of 'place' has been increasingly acknowledged, particularly in the light of contemporary processes of devolution of technology and innovation policy to the city and regional levels, increased support to 'green' regional clusters and the active shaping of technological transitions by local actors (Cooke, 2010; Hodson and Marvin, 2009; Morgan, 2013; Dawley, 2014; Fornahl et al., 2012; Gee and Uyarra, 2013). Scale and place have been identified as key vectors shaping processes of industry emergence and diversification (Boschma and Frenken, 2011), including the transfer of knowledge between related sectors that may eventually enable the emergence of new, cleaner, industries.

Government intervention to support low carbon and environmental innovation is therefore broad encompassing, involving several policy domains (environmental, technology, industrial policy) and different levels of government. Relevant policy instruments also differ according to their rationale and orientation e.g. demand-pull, technology push or systemic instruments (e.g. Rennings, 2000), type (direct and indirect financial support or non-financial, softer forms of support) and target group (e.g. whether it provides cross-sectoral 'neutral' support or supports specific technologies or sectors) (OECD, 2014). Del Río and Bleda (2012) for instance differentiate between support for R&D and support for market deployment, including feed-in tariffs (FITs), quotas with tradable green certificates (TGCs) and bidding/tendering schemes. While both kinds of instruments have been found to be important for driving innovation in environmental technologies, demand-pull and 'technology-neutral' instruments tend to favour the deployment of mature technologies and are considered more appropriate for later stages of the innovation process (Costantini et al., 2015; Hoppmann et al., 2013; Del Río and Bleda, 2012). Del Río and Bleda (2012) therefore suggest the need for a combination of supply-push and demand-pull instruments combined with the use of technology specific support.

Besides the choice of instruments, other key factors influencing the effectiveness of intervention include specific design features (e.g. duration and level of support, target group), modes of implementation (including enforcement), policy styles and actor constellations, and how these work together in a 'mix' (Del Río, 2009; Flanagan et al., 2011; Rennings, 2000). The level and duration of support of financial incentives is an important aspect influencing investment decisions by firms, particularly at the early stages of the technology. The stringency of particular instruments has also been found to positively impact innovation and export performance (Costantini and Crespi, 2008; Porter and van der Linde, 1995). In addition, a high degree of stability and predictability in an instrument's direction, rules, and timing (Rogge et al., 2011) can contribute to reducing uncertainty and secure firms long-term decision to invest in R&D. According to Norberg-Bohm (1999), reducing uncertainty needs to be accompanied by certain flexibility in meeting environmental policy goals. Del Río (2009) further adds that flexibility helps long-term compliance by stimulating a wide range of technological solutions.

Innovation system views have also suggested that policies should focus on addressing systemic failures or gaps, and ensure the support of system 'functions' such as market formation, knowledge development and entrepreneurial experimentation (Bergek et al., 2008) via appropriate and integrated sets of instruments. System failures or gaps in the support for renewable energy technologies have been identified particularly at the intermediate stages of the innovation chain (after the demonstration stage), preventing their successful commercialisation (Foxon et al., 2005; Ghosh and Nanda, 2010; Grubb, 2004).

However, these approaches are more concerned with whether the policy mix is balanced or comprehensive (in terms of sufficiently addressing key system functions or addressing particular gaps) than with the coherence of the resulting policy mix. Furthermore, they rarely consider the temporal footprint of policy mixes and tend to overlook the multi-scalar and cross-country influences on system changes by adopting a narrow national focus (Binz et al., 2014; Flanagan et al., 2011; Quitzow, 2015.).

Policy instruments generally come in 'mixes', with the consequent need to pay attention to potential interactions, conflicts and tensions between goals, rationales, instruments and implementation approaches of different instrument at different levels and at different times (Flanagan et al., 2011; Magro and Wilson, 2013). For instance different instruments from different policy domains or levels of governance may target the same groups and either reinforce each other or cancel each other out. For instance, several studies have identified problems arising from interactions between the introduction of emission trading schemes and public support for electricity from renewable energy sources, such as higher costs of compliance and double counting of emissions reduction, thus potentially undermining the objectives of the schemes (Sorrell, 2003; NERA, 2005; Del Río, 2006).

Interactions also occur between domestic and foreign policy instruments, since national regulatory and support frameworks in one country tend to influence the sector beyond the country's boundaries (Quitzow, 2015; Ghosh and Nanda, 2010). Lanjouw and Mody (1996) for instance found that strict regulations in the US for the vehicle emission sector contributed to innovation in countries such as Japan and Germany and Peters et al. (2012) identified positive cross country policy spillovers in the case of photovoltaic energy power.

Paying attention to policy *coherence*, understood as the presence of complementarities or synergies (and relative lack of tensions) across instruments (Howlett and Rayner, 2007; Rayner and Howlett, 2009) may erroneously lead us to consider that an optimal or coherent mix is achievable, through e.g. better policy coordination. Policy mixes are rarely consciously constructed but rather emerge from institutional, political and cultural decisions that unfold over time (Flanagan et al., 2011). Attempts to improve coherence can lead to unexpected outcomes, and overtime dimensions (and particularly actors) in the policy mix change and influence policy coherence (or lack thereof) in often unpredictable ways.