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Removing environmental market failure for green start-ups through support mechanisms: insights from the British, French and German energy sectors

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Executive Summary

Environmentally-relevant market failure, related to the lack of value attached to environmentally-beneficial economic activity, constrains environmental entrepreneurship [Dean & McMullen, 2007]. Unless this market failure is addressed, green start-ups will be confined to a "green prison" [Pacheco et al., 2010], unable to grow and disseminate their eco-innovations out with environmental niche markets. In Britain, France and Germany, support mechanisms promote the expansion of renewable power technologies. This paper examines environmental entrepreneurs' perceptions of the importance and effectiveness of support mechanisms in removing environmental market failure in the energy sectors of these three countries. Our findings suggest that these support mechanisms are perceived by entrepreneurs as having provided a crucial pecuniary motivation among consumers to adopt eco-innovation, creating greater market certainty for green start-ups. However, when these support mechanisms are reformed, aiming at greater market integration for eco-innovation, green start-ups find this transition from protection to more market exposure as challenging and more suited for incumbent firms.

Keywords

Green start-up, environmental entrepreneurship, environmental market failure, energy, eco-innovation, support mechanism

Contribution to *Small Business Economics*, special edition on green start-ups

I Introduction

Environmental entrepreneurs face barriers to success that are particular to the environmental-nature of their activities. These include consumer resistance to environmental innovations [Linnanen, 2005, Pastakia, 1998], technological complexities of environmental innovation [Schick et al., 2002] and access to finance [O'Rourke, 2010]. Arguably, for green start-ups, many of these barriers derive from environmentally-relevant market failures which prevent entrepreneurial actors from addressing environmental problems [Dean & McMullen, 2007]. Essentially, the environmental benefits or "goods" are undervalued by the market [Kotchen, 2009] and, as a result, are at a competitive disadvantage compared to conventional technologies [Pacheco et al., 2010]. Addressing these market inefficiencies is crucial to removing barriers to environmental entrepreneurship. The influence of public policy on the incidence of environmental entrepreneurship is a research gap in the field of sustainable entrepreneurship [Hall et al., 2010] and, therefore, it is suggested that policies that address environmental market failure are an important issue for study.

Within the energy policy literature, there has been discussion of the impact of support mechanisms for renewable power, namely feed-in tariffs, on bolstering investor confidence in green energy [Bürer & Wüstenhagen, 2009, Hofman & Huisman, 2012]. In contrast, there has been little discussion of how green start-ups perceive policies aimed at removing environmental market failure. Having the perspective of investors without that of the actual change agents of these crucial policy instruments and their effectiveness in removing environmental market failure is an imbalance and represents a gap in the current literature. This paper examines the environmental entrepreneurs' perceptions of the importance and effectiveness of support mechanisms in removing environmentally-relevant market failure.

Using case studies of the Britain, France and Germany, our study focusses on green start-ups operating the energy sectors of these countries. As regards the boundaries of the study, the primary data collection took place between early 2014 and early 2015, so this is the period of focus. The research honed in on a cohort of the most prominent energy policies, from an entrepreneurial perspective, that existed in the three countries at the time and respondents were asked during each interview if any major relevant policies had been missed. The three cases are based on policy information, semi-structured interviews with founders and key staff within new ventures engaged in renewable energy and field notes from practitioner energy conferences across the three countries.

II Green start-ups and environmentally-relevant market failure

Green start-ups face economic barriers that are related to the environmentally-beneficial nature of their activities. [Dean & McMullen, 2007] claim that "environmentally-relevant market failures" prevent entrepreneurial activity targeting environmental problems. They suggest that this market failure is underpinned by the fact that environmental well-being, namely the existence of a high quality natural environment able to deliver the ecosystem services important to humans [de Groot et al., 2002], an outcome of green start-ups' activities, is a public good and is, therefore, non-excludable. In other words, this improvement in

environmental well-being is enjoyed by all economic actors regardless of whether they have paid for it or taken on costs to contribute to it. This non-excludability leads to green start-ups failing to escape from the green prison described by [Pacheco et al., 2010].

This green prison arises from the absence of economic rents available from pursuing opportunities for sustainable development and means that environmental entrepreneurs will always be at a competitive disadvantage due the additional costs which they must bear that other less sustainable actors do not [Pacheco et al., 2010]. Consequently, the level of environmental entrepreneurship will be "inefficiently low" as it represents an "impure public good", with the positive externality, in the form of enhanced environmental well-being, not factored into economic decisions [Kotchen, 2009].

Governmental interventions can tackle this environmentally-relevant market failure through removing the disadvantage from which eco-innovations suffer. This could be through what [Kotchen, 2009] refers to as "demand drivers" in the form of schemes including renewable energy obligations, carbon reduction plans and emissions regulations. [Dean & McMullen, 2007] highlight that transaction costs make the internalization of negative environmental externalities difficult without particular institutions to attribute responsibility for environmental damage (from pollution, emissions) to market actors and charge them for the damage their activities cause. They refer to the example of carbon trading schemes as one such institution that can "internalise" these social costs arising from economic activity through compelling actors to pay for the carbon that they emit. Schemes like the renewable energy obligations, as mentioned by [Kotchen, 2009] above, are an alternative to carbon pricing initiatives which penalise the emission of carbon. They are, instead, a means of rewarding the uptake of ecologically-friendly technologies by internalising the social benefit of eco-innovation. Support mechanisms for renewable power act to internalise the positive environmental externality of eco-innovation, enabling green start-ups to gain economic returns from their activities.

Support mechanisms, embodied by subsidy schemes for renewable energy, correspond to the "social market" philosophy of public environmentalism [Isaak, 1998] in which the government tries to steer market preferences in a society towards ecologically-superior choices. [Isaak, 1998] discusses the way in which he believes that stringent environmental regulations in Germany have induced greater environmental awareness among the German public and have led to the embedding of a "green logic" within German society. Arguably, support mechanisms for green energy are similar in that they attempt to orientate society towards consuming renewable energy, with decentralized citizen-energy, Bürgerenergie, contributing to green logic [Isaak, 1998], in which public participation in the sustainable transformation of the energy system, through members of the public being able to make money from generating renewable power, reinforces public support for national investment in the transition to a low-carbon power sector [Foxon, 2013]. [Isaak, 1998] distinguishes this "social market" public environmentalism from a "free-market" public environmentalism in which the government establishes property rights, attaching a price to emissions, for instance, and then leaves the market to deliver and deploy environmental innovation.

Innovation systems “guide, aid and constrain individual actors within them” [Jacobsson & Bergek, 2004] and they suggest that, in the nascent and expansionary phases of a product’s and industry’s evolution, protected spaces can provide opportunities for learning and improvement to prepare technologies for diffusion on the mass market. Such protected niches are crucial given the disadvantages faced by new green technology in terms of cost, the lack of direct benefits to buyers and investors (the benefits from green technology are collective in the form of an enhanced natural environment), subsidies given to conventional energy technologies and the lobbying activities associated with conventional technologies.

Support mechanisms for renewables institute a “protected space” for green start-ups. This discussion is located in a wider debate about types of intervention which can promote environmental innovation, contrasting more traditional forms of regulation, such as command and control policies, with more sophisticated market-based mechanisms [Demirel & Kesidou, 2011, Holt et al., 2010, Horbach et al., 2012]. Whilst the literature is insightful about ways in which policies can induce eco-innovation, there has been less of a specific discussion of policy measures capable of stimulating and nurturing environmental entrepreneurship in the form of green start-ups.

Establishing the credibility of green start-ups among investors is crucial, with [O'Rourke, 2010] claiming that, despite the growth of investment in the green tech sector, it remains comparatively difficult for green entrepreneurs to access venture capital. She argues that expectations among venture capitalists regarding fast returns are not compatible with eco-innovation. [Kenney, 2012] supports this view, suggesting that the cleantech sector is less prone to opportunities which offer investors stellar returns, highlighting that there has not been a cleantech equivalent of Google or Yahoo!, capable of yielding massive returns on investment for venture capitalists. He also claims that venture capitalist interest in cleantech is highly related to the price of oil and this is problematic at a time of very low oil prices.

[Bürer & Wüstenhagen, 2009] emphasise the popularity among venture capitalists of feed-in tariffs for renewable power which provide a fixed payment for a set number of years in exchange for renewable power that is fed into the grid. They find that this instrument provides long-term security for investors, as it reduces price and volume risks and, importantly, argue that it is preferable for investors to quantity-based schemes, such as the Renewables Obligation, which is vulnerable to price volatility, with this volatility difficult for entrepreneurial actors to absorb. Intriguingly, venture capitalists rate energy security and competitive advantage more highly than climate change as triggers for investment in renewable energy, with US investors very sensitive to the price of oil [Bürer & Wüstenhagen, 2009]. Despite the danger that such fixed price schemes, involving socializing the risks, set the wrong price and, in so doing, over-burden the consumer, such fixed price schemes have generally led to lower prices per MWh than schemes that do not fix prices [Skea et al., 2011]. [Hofman & Huisman, 2012] repeat the survey undertaken by and find that support for feed-in tariffs among investors remained very high. However, they describe how, since the financial crisis, feed-in tariffs in certain EU countries have been retrenched due to budgetary constraints. The ongoing high popularity of feed-in tariffs, identified by [Hofman & Huisman, 2012], indicate that, de-

spite the fall in the cost of renewable energy technologies, such an instrument could still play a major role in shoring up investor confidence in green energy at a time of heightened perceptions of risk and volatility.

Environmental entrepreneurship is embedded in society and its success reflects the extent to which society values the preservation of the natural environment [Anderson, 1998]. Environmental market failures mean that the eco-innovations brought by green start-ups are undervalued and alleviating these market failures should be a priority in creating a context conducive to environmental entrepreneurship. Support mechanisms, such as feed-in tariffs and quantity-based schemes (like the UK's Renewable Obligation Certificate programme), ensure a protected space [Jacobsson & Bergek, 2004] in which green start-ups in the energy sector can grow without full exposure to market conditions. Market conditions can be difficult for these actors in view of market failure.

III Methodology

A case study research approach was adopted to undertake this study, with each country - Britain, France and Germany - constituting a case. The case study method is naturalistic in nature [Lincoln & Guba, 1985], in that it attempts to understand the relationships, mechanisms and perceptions of social actors in a particular context. According to [Yin, 2009], case studies are particularly appropriate in situations in which "the boundaries between phenomenon and context are not clearly evident" (p.18).

Britain, France and Germany were selected as particularly insightful cases to study green start-ups, as they are each major, advanced economies, with all three having registered a GDP per capita above the OECD average of advanced economies in 2015 [OECD, 2017], and have all committed themselves to stringent sustainability targets. Each country has, for example, adopted legislation on carbon emissions and the transformation of the energy sector [Bundesministerium für Wirtschaft und Energie, 2016, Committee on Climate Change, 2017, Ministère de l'Ecologie, 2015] and, correspondingly, the investment in and development of a green energy industry has considerable strategic importance within the three countries. Since their energy policies and systems diverge radically, with path dependent trajectories resulting from different past energy policies, the three countries provide opportunities for rich contrasts and comparisons.

Within the three cases, new ventures were selected and interviews were conducted with the founders or key members of the entrepreneurial team within the new venture. The unit of analysis is the perceptions of these environmental entrepreneurs, as represented by the founders or entrepreneurial team members, towards policies aimed at removing environmental market failure. A sample of firms to contact were selected; these firms corresponded to the Emerging David construct [Hockerts & Wüstenhagen, 2010], in that they had generally low market share, had been founded relatively recently and generated environmental value (i.e. through contributing to the diffusion of green energy). The age of the firms sampled, at the time of the field work, are featured in Table 1 below:

Tab. 1: Age and Sector of Firms Participating in the Study

Country	1-5 years	5-10 years	10-15 years	Solar	Wind	Marine	Biomass
Britain	7	3	-	2	4	3	1
France	4	1	3	4	2	1	1
Germany	4	2	3	2	3	-	4

Quelle: Own Creation IEK-STE 2017

In comparison to incumbent energy companies, all firms sampled were comparatively small. Although a number of firms sampled were larger and older than the term “start-up” would typically imply, it is argued that it was appropriate to include these firms in the study, as the sustainable transformation of industries relies on the mass-market dissemination of environmental innovation [Schaltegger, 2002]. Arguably, Emerging David firms that are gaining in experience and market share [Hockerts & Wüstenhagen, 2010] are in a better position to disseminate environmental innovation and to challenge incumbent firms.

According to [Adams et al., 2015], sustainability-orientated innovations can either be “internally-orientated”, focused on improving the sustainability of products, processes and practices within the firm or directed at the wider socio-economic system out with the firm. In the case of the new ventures in this study, they are focused on disseminating either renewable energy technologies, renewable energy generation processes or selling renewable power on the market, thus the impact of their sustainability-orientated innovatory activity is beyond the firm. It is this wider socio-economic system impact which is at the heart of environmental entrepreneurship and this is how these firms create environmental value.

Sampling frames of new ventures for each country were constructed using directories from renewable energy industry associations. Firms were contacted and a total of 28 extended interviews were conducted that were evenly spread across the three countries. Interviews lasted on average 41.5 minutes; in the first part, respondents were asked questions about the policy context in their own country and, in the second part, they were asked about policy differences in the other two countries. Five additional shorter German interviews were also conducted at a practitioner conference relating to specific reforms being undertaken in the German context.

Field notes in the form of observations at practitioner conferences provided “conceptualization and analytic remarks” [Corbin & Strauss, 2008] and served to complement the interview data. They also enabled the inclusion of other stakeholders’ perspectives, such as policy makers and representatives of incumbent energy firms.

The qualitative data was analysed using a coding technique consisting of three stages. Open codes, involving descriptive analysis of the data were refined, in a second stage, into higher-level more abstract and analytical codes from which overarching patterns and themes emerged in the final stage [Miles et al., 2014].

IV Findings and Discussion

Insights drawn from the data are presented separately for each of the three countries. While their energy policies differ, all three countries also share some common ground and have all introduced support mechanisms in the form of feed-in tariffs. Feed-in tariffs apply to smaller levels of generation from renewable sources and pay generators of renewable electricity a fixed payment over a set period of time for the power they feed into the electricity grid. Recently, these tariffs have been associated with substantial volatility due to periodic revisions of their value to prevent excessive uptake and to control costs [Avril et al., 2012, Department of Energy & Climate Change, 2015]. Reforms to these support mechanisms ha-

ve been undertaken [Bundesministerium für Wirtschaft und Energie, 2016]. The environmental entrepreneurs' perceptions of the importance and effectiveness of these support mechanisms and the ongoing reforms are presented below. The role of support mechanisms as regulatory drivers in removing market failure is discussed in more detail towards the end of this chapter.

IV.1 British perceptions of the importance and effectiveness of support mechanisms

The implementation of support mechanisms was considered to be a catalyst in enhancing market prospects for green power, therefore enabling market entry for new ventures. In particular, feed-in tariffs were perceived as having provided a pecuniary motivation for consumers to adopt renewables at the household level, mainly in the form of solar panels. This pecuniary motivation results from the payment that a generator receives for feeding renewable power into the grid which, ultimately, enhances the return on investment in a renewable power appliance, with respondent B8 commenting:

90% of my customers are not thinking of this from a green point of view. What they are worried about is making extra money and the feed-in tariff needs to incentivise these people...The difficulty is now...if the feed-in tariff starts to dwindle away, are renewable energies in the public mind set enough for it to survive? (B8)

Essentially, the feed-in tariff subsidy offers the consumer a sufficient return-on-investment to motivate adoption of green power in the form of micro-generation technologies. Interestingly, the respondent suggests that the pecuniary motivation is far more critical than any concern for the natural environment in driving consumer adoption of eco-innovation. They also cast doubt on whether renewables will be self-sustaining if the support declines.

Other respondents emphasized how they considered the feed-in tariff to be effective in attracting investors, wary of the uncertainty associated with environmental innovation, with B10 highlighting that the period covered by the feed-in tariff is crucial in terms of the value of their investment:

The fixed guarantee for fifteen years is very important...the majority of the value of the assets is determined by the first fifteen years... without subsidy, you don't get the returns which are required. This asset class competes with bonds, equities, infrastructure projects in different geographies (B10)

In the longer term, power prices are less predictable for investors and, therefore, the value of an asset after this period is likely to be residual and this reinforces the need to ensure certainty for investors as regards the revenue they are likely to receive in the first fifteen years. In ensuring the stability of returns in the earlier phase, the feed-in tariff appears to be a good mechanism to increase investor confidence. B10 argues that investors are agnostic in terms of where they invest their money and that green power must compete with other types of investment which may offer greater returns or which are more attractive in terms of

their risk profile. Given the capital intensive nature of "green sector" investments and the longer-term horizon of commercial viability [Criscuolo & Menon, 2015], the need for reassurance, in the form of subsidies, is arguably greater in attracting external capital. Support mechanisms which enhance this risk-return trade-off are seen as crucial in incentivizing investors and the comments by B10 raise issues about the paring back of support mechanisms, especially if doing so changes the risk profile of green energy investments.

Whilst the respondents above emphasized the value of the support mechanisms in lifting the economic disadvantage that green energy faces in the market, a recurrent theme was that the UK government's intervention to combat market failure was inconsistent. An example of this is in relation to the degression mechanism, in which the feed-in tariff is reduced periodically to reflect reductions in the cost of renewable power technologies. For respondent B3 the erratic nature of this degression mechanism meant that certain ventures had to diversify into other areas of energy-related activity:

…With the degression...it's feast or famine. So, if you're in that side of the business, you need to have other stuff going on. (B3)

There were also suggestions that decisions to pare back feed-in tariffs and reforms being undertaken to the support mechanisms were rooted in economic challenges. Repondents argue that the UK's economic position must strengthen to withstand the cost of widespread support for the diffusion of renewables (e.g., B7). A pattern observed in the interviews with British participants is the notion that governments are favourable to sustainability when economic times are good, but, in difficult economic circumstances, sustainability is a secondary priority. Fears about the effect of the cost of support mechanisms on economic competitiveness with other nations is another major concern. Higher energy prices (as the cost of support is levied on energy users) could be difficult for economic actors to absorb if other countries do not undertake similar commitments. Under the free-rider principle [McMillan, 1979], countries may free-ride on the sustainability efforts of others without accepting costs themselves.

Reforms to support mechanisms were associated with greater uncertainty and were considered pernicious for investor confidence. Although there were positive comments about the fact that contracts-for-difference provide generators with a fixed price for the power that they produce, respondents were apprehensive about the risk of being unsuccessful in the auction for support:

...Whilst we're not even sure if there is a project at the end of the day...It creates more binary risk which is not great for investors...and that will drive up the capital cost again (B10)

With renewable energy projects, there are sunk costs associated with preparing for participation in these auctions, namely grid connection, administrative work, deposits; the costs of being ultimately unsuccessful in the auction process could be very difficult for a new venture to absorb. Indeed, the risk is "binary" in nature, according to participant B10 - one is either successful or unsuccessful - whereas, under the ROC (Renewable Obligation Certificate)

scheme, the risk was the value of the subsidy for generating a MW of renewable power. Such a binary risk is suggested by B10 to be particularly unpalatable from the point of view of investors and they propose that this type of risk will, ultimately, increase the cost of financing projects. This risk associated with the auctions is exacerbated by uncertainty surrounding how support will be allocated to different technologies:

…and they [the government] still haven't agreed the formula by which this would be given out...So, that creates uncertainty...So, nobody is willing to invest. So, the government insists on introducing these things half- baked.....We have no idea how much of that [the pot of money] will be given to nuclear, wind, on-shore, off-shore…(B6)

Since technologies like nuclear, that could, potentially, crowd out renewables, are included in the British contracts-for-difference support mechanism, the way in which support is distributed is of real concern to green start-ups and any dubiety about the way in which support will be allocated appears damaging. The comment about the government's "half-baked" implementation of the reforms implies that there has been insufficient planning, on the part of the UK Government, as to how best to design new support mechanisms to integrate renewables into the market. The handling of the emergence of eco-innovation from its "protected space" [Jacobsson & Bergek, 2004] is perceived as disjointed and abrupt.

IV.2 French perceptions of the importance and effectiveness of support mechanisms

French participants in the study were, generally, more critical, not of the feed-in tariff mechanism in itself, but of the way that this mechanism had been managed. There was praise for the feed-in tariff in that it was viewed as having given rise to a renewables industry in France and as having fostered the growth of this industry. Since electricity prices are depressed in France as a result of the presence of low-cost nuclear power [Eurostat, 2015], a feed-in tariff to subsidise renewable power generation was necessary to incentivise consumer uptake and stimulate a renewables industry:

The level of the feed-in tariff…in France…in 2006, 2007 was set at levels which allowed the emergence of an industrial branch in wind power, in PV (Photovoltaic) and in biogas…..For me, as an investor, this mechanism is a very good one….means that we can get on top of our business plan….the business and investment models are secured…(F6)

Echoing comments by British respondents, F6 describes how the feed-in tariff mechanism provided stability which was beneficial to business and investment models, as it provided reassurance about returns on investment and was, therefore, instrumental in alleviating entry barriers to the power industry. It, in effect, tackled the environmental market failure affecting renewables in this context. Indeed, there were frequent references throughout the French data to the "nuclear rent," invoking the idea of nuclear power's entrenchment in the French energy system.

There was, however, criticism of the credibility and integrity of the feed-in tariff mechanism on the part of French respondents. F1 referred to a "huge boom" in the uptake of solar power that the feed-in tariff had caused between 2008 and 2010 and respondent F4 claims that the feed-in tariff caused distortionary effects on the energy market, triggering the growth of a large-scale PV (Photovoltaic) industry that did not correspond to real levels of market demand. These reflections indicate a lack of confidence in how the support mechanism was managed by the French government and a feeling that it led to unrealistic levels of uptake which could not be sustained.

Retrospective changes to the feed-in tariff were strongly criticized by respondent F5 who linked the changes to the fears about economic competitiveness; retrospective changes to support were argued to undermine the integrity of support mechanisms in the eyes of investors. Indeed, following its introduction, the French feed-in tariff for solar PV (Photovoltaic) has undergone major revisions to avoid a "speculative bubble" and this has increased the complexity of the mechanism and the regular changes have been criticized as "inconvenient for investors" [Avril et al., 2012]. If a "fixed tariff" is subsequently revised, this would erode confidence in the endurance of such a mechanism and be harmful to the confidence among entrepreneurs and, importantly, financial investors in the market prospects for green start-ups in the French renewable energy market:

The feed-in tariff continues to go down, I think it's about 28 cents now…which is much lower than the 60 cents it once was….at the highest point. So, there's this big push now for what we now call….auto-consommation. In English, I think it's "self-consumption". (F1)

As the feed-in tariff continues to decline, such a business model, based on consumers generating their own power, becoming self-sufficient, as opposed to feeding power to the grid in return for payment, is being promoted. The difficulty with such a business model is that it is dependent, to a degree, on factors such as the movement of power prices for the end-user and, in France, these prices are comparatively low. This is linked to the nature of consumers' motivation for adopting green energy. If this motivation is extrinsic, as indicated by UK respondents in the UK context above, then it will be difficult to promote wider adoption among the consumer. [Belz & Binder, 2015] argue that the wider diffusion of eco-innovation is dependent on breaking out of niche markets. If the pecuniary motivation is the main driver for adoption, in the absence of a support mechanism, this diffusion seems more difficult to achieve.

There was evidence of limited importance being attached other means of removing market failure, namely the emissions targets and emissions trading scheme. In relation to the Energy Transition Law, F1 described the goals within this law as "abstract ambitions" and stressed that it was the implementation of this law in terms of the feed-in tariffs and tenders for larger-scale generation that counted, from the point of view of their firm. The EU carbon trading scheme was criticised by F5 as having failed to create a sufficient incentive to adopt clean technology. Among respondents, these other schemes which address market failure alongside the support mechanisms appear not to have substantial credibility.

Whilst the French feed-in tariff was seen as having played a pivotal role in removing market failure for French new ventures, the way it has been managed since its inception has undermined its credibility among respondents featured in the study.

IV.3 German perceptions of importance and effectiveness of support mechanisms

German respondents remarked on how the German feed-in tariff scheme, known as the Erneuerbare Energie Gesetz (hereafter referred to as EEG), had led to the emergence of a vibrant "Citizen Energy" - Bürgerenergie - movement based on opportunities for the decentralized generation of power. Citizens and local communities could earn money from generating renewable power and feeding into the grid. This helped them to secure loans for projects and to gain a financial return on investment meaning that their projects had a viable business model. This market structure, based on decentralized power, was seen as more conducive to entrepreneurship. However, within the German data, there was anxiety about the trajectory of the EEG in light of major changes, with feelings that the original aims and spirit of the mechanism were under threat:

The EEG was very important to me for a long time, because it provided a really good base… now, in 2014, the change is massive…..It is being reversed…..They are forcing renewable energy operators…..to go in a direction that can only be negative (G12)

We have firms with which we work…..and the market has collapsed by 50%....an SME tried to keep going….but they had to let people go……These are the consequences of the restructuring of the EEG. (G10)

These comments reflect a perception that, although the mechanism offered an excellent foundation for entrepreneurial activity in Germany, this foundation is now being undermined and, indeed, there are indications (from G10) of the restructuring of the EEG having severe impacts on the market for SMEs, suggesting that it is feared, among green start-ups, that environmental market failure may return if the support mechanism is restructured like this:

…Citizens won't risk money….no bank will finance it…if they do not have security. If they have to spend money first…..and don't know what will come out of it [out of the auctions for support] (G1)

This remark relates back to consumer motivation to adopt eco-innovation, with the implication that consumers (and investors) are focused on the returns that they are likely to receive. In order to adopt eco-innovation, they need to be sure of stable returns. This reinforces the importance of the pecuniary incentive which, previously, had been assured by the EEG, but which is now far more uncertain. Without such a stable incentive, the respondent implies that the uptake for eco-innovation will be weaker and market failure will, therefore, persist as it had previously.

Removing environmental market failure has a cost, the support mechanism must be financed, and the cost of the EEG featured prominently in the German data. The cost of the EEG is levied from consumers' energy bills and the cost of the support mechanism to the average consumer is an ongoing political theme in Germany [Büsgen & Dürrschmidt, 2009]. The political ability to fund a generous support mechanism, capable of the long-term removal of market failure, is contingent on public consent, with this consent being related to public perceptions of the cost of the EEG and the way this cost is distributed. A view emerged, in the German data, that the costs of supporting the EEG were not distributed fairly. This is related to the fact that energy-intensive companies are exempted from contributing to the financing of the EEG:

It is clearly not justified that in Germany large firms can purchase their power very cheaply whilst the public pay considerably more…. (G7)

This opt out for large firms….I don't agree with it…..because the burden is always transferred to the citizens….. (G10)

The objection here, raised by respondents G7 and G10, is that energy intensive firms have benefited from the fact that the expansion of renewables has led to lower prices of electricity whilst, for the consumer, the cost of electricity is comparatively high partly due to the levy

on bills to fund the EEG. Perceptions of iniquity in the sharing of the cost of the support mechanism add to concerns about the public legitimacy of the EEG. This gives rise to questions about the distribution of the cost of the removal of environmental market failure to promote the dissemination of eco-innovation.

Respondent G7 further expressed frustration that there was an absence of a stable institutional framework for green start-ups in Germany. This unpredictability can be problematic, because, once a project has been prepared and planned, the rules of the game might have changed:

…to build a windfarm or a PV (Photovoltaic) installation….you need half a year….to plan a biomass plant, you need two to three years….and the Renewable Energy Law is being reformed every three years …the law changes and investors don't invest…because there is no legal foundation. (G7)

This view was accompanied by criticism of the way in which the reforms to the support, aimed at promoting the market integration of start-ups, had been implemented. Respondents alluded to the way in which the implementation disadvantaged start-ups, referring to the administrative costs associated with participation in tenders for support which were difficult for start-ups to bear. Like responses in the UK context, G11 expressed concern about the danger of being unsuccessful in a tender process after having incurred substantial sunk costs, explaining that, for start-ups that are not diversified, this could result in financial failure. G14 argued that the exposure to the market was imposed at too low a level and was inappropriate to new ventures. As in the French data, the implementation of the European emissions trading scheme was criticised by respondents, reinforcing the view that these macro schemes targeting environmental market failure are ineffective. It was suggested that a carbon price would pose an excessive burden on the German consumer, highlighting that measures to remove environmental market failure must be reconciled with public acceptance.

Germany has been an early mover in addressing environmental market failure through introducing its EEG which has been conducive to the growth of a decentralized, entrepreneurial energy movement. However, the EEG has, to a certain degree, been a victim of its own success and, as costs have grown in line with the greater dissemination of renewables, there has been increasing controversy over the cost of removing market failure and how this cost should be distributed. In the German context, there was substantial dissatisfaction among respondents about the volatile institutional framework for eco-innovation in the energy sector, reportedly affecting entrepreneurial activity involving renewables.

IV.4 Support mechanisms as regulatory drivers in removing market failure

Investment in eco-innovative renewable energy technologies is particularly sensitive to "regulatory drivers" according to [Bürer & Wüstenhagen, 2009]. Schemes like the feed-in tariff and the UK's ROC (Renewable Obligation Certificate) were praised by respondents as having established the existence of a stable market for eco-innovation. Respondents

stressed the role that financial incentives played in promoting the adoption of renewable energy among consumers, echoing ideas about eco-innovation as a "high involvement" product and, therefore, encountering consumer resistance [Jansson, 2011]. Given the perceived dominance of the pecuniary motivation over environmental values in consumers' decision to adopt, the support mechanisms appear to have been vital in the removal of environmental market failure.

An ongoing conflict was uncovered in the field notes between the social market philosophy of public environmentalism [Isaak, 1998], embodied by support mechanisms to orientate consumer and market preferences towards eco-innovation, and his free market philosophy of public environmentalism, embodied by macro-economic instruments, such as carbon prices. In a public appearance in February 2015, Ignacio Galán, chairman of Iberdrola, called for market based approaches for the integration of renewables involving minimal intervention – green certificates and carbon prices. From the perspective of large, diversified firms like Iberdrola, schemes like carbon pricing, involving minimal intervention, are appropriate to their business models which are based on generating and marketing power at a massive scale. For large-scale actors, small changes in the competitiveness of eco-innovation thanks to an increase in a carbon price make a substantial difference to their market success, as this incremental increase in competitiveness is spread over a massive volume. However, in the interview data, respondents attached relatively little importance to mechanisms like the carbon price floor and the French carbon tax, reinforcing the theme that these initiatives, based on minimal intervention, are not of great relevance for entrepreneurial actors in comparison to the more interventionist support mechanisms, namely the feed-in tariffs. Moreover, they lack credibility and are affected by concerns about public acceptability.

For green start-ups, these schemes are, arguably, too abstract to fundamentally change the market framework for their eco-innovations and it is suggested they are, therefore, insufficient to provide a credible business model for entrepreneurs and reassure financial investors. This is consistent with findings by [Criscuolo & Menon, 2015] that policies like feed-in tariffs and tradable certificates are more successful at raising levels of investment in environmental technologies than shorter-term programmes like tax rebates. They argue that this is because these mechanisms inculcate "long-term policy stability, sustainability and credibility" (P.52).

There were indications of real concern that the retreating feed-in tariff and the introduction of contracts-for-difference would be detrimental to the "Citizen Energy" movement, with energy and environmental law expert Thomas Schomerus commenting at the 2014 Lüneburg Energieforum:

This [the reforms] will really disadvantage Citizen Energy. Those that are not successful in obtaining a contract will not receive any support. Who can afford that? By and large, the big players…

He is suggesting that the reformed mechanisms, aimed at market integration of renewable power, are not favourable to decentralised energy projects, as the risk of not being successful in obtaining support could prove financially disastrous. He implies that these competitive mechanisms are orientated towards the "the big players" that have the resources and diversification to thrive under these competitive market conditions. Since "Citizen Energy" related projects constitute a large part of the market for green start-ups, reforms impacting on the viability of these projects pose a threat to market prospects for their eco-innovations.

For green start-ups engaged in renewable energy, support mechanisms have profoundly changed the rules of the game in terms of removing environmental market failure thanks to their interventionist approach in establishing a market for entrepreneurial actors.

V Conclusion

The role of public policy for stimulating and supporting environmental entrepreneurship is a pivotal research issue [Hall et al., 2010]. Our study shows that support mechanisms are regarded by green start-ups as a catalyst in that they have alleviated the environmental market failure which besets eco-innovation and, therefore, minimised entry barriers in the energy market for start-ups. However, as eco-innovation achieves greater dissemination thanks to the support mechanisms, this leads to serious questions of how to successfully manage the integration of green start-ups into the market without stifling this "entrepreneurial flavour".

For policy makers, the findings in this paper indicate that support mechanisms grounded in more social market environmentalism [Isaak, 1998] are effective in entrepreneurial opportunity creation [Scott & Venkataraman, 2000] for green start-ups. This opportunity results through these support mechanisms addressing environmental market failure in two ways. Firstly, they provide a financial incentive to motivate the adoption of eco-innovation among consumers and this was perceived by respondents as pivotal, as they viewed the pecuniary motivation as dominant in consumers' decisions to adopt eco-innovation. Secondly, mechanisms like the feed-in tariff and ROC (Renewable Obligation Certificate) reassure financial investors that there will be a secure market for green start-ups' eco-innovations and this is vital given the difficulties that green start-ups confront in obtaining finance [O'Rourke, 2010]. In contrast, mechanisms rooted in the free market philosophy of public environmentalism [Isaak, 1998] are not perceived by green start-ups as having substantial power in changing the rules of the game for actors like them. As the field notes suggest, these mechanisms, based on minimal intervention, are more suited to the business models of large incumbent firms which may be undergoing a greening strategy [Azzone & Noci, 1998].

This paper links the idea of [Hall et al., 2010] about policy emphasis in the promotion of green start-ups with philosophies of public environmentalism by [Isaak, 1998], drawing on both an industry and geographical setting, arguing that policies from the social market public environmentalism sphere are more relevant to start-ups whilst policies belonging to the free market public environmentalism sphere are more relevant to incumbent firms undergoing corporate greening. Social market public environmentalism, as represented by instruments

like support mechanisms, is consistent with a “thousand flowers” approach to energy policy, conducive to the growth of smaller, decentralised actors in the energy system [Foxon, 2013]. This “thousand flowers” approach can be blended with elements of the “market rules” pathway, consisting of free market mechanisms like emissions trading, relevant to incumbent actors and elements of the “central coordination” pathway based on large-scale tenders for technologies, such as carbon capture and storage and large-scale renewables, again more relevant to incumbent actors [Foxon, 2013]. A differentiated approach to energy policy, employing elements of both types of free and social market environmentalism, is argued to be valuable in developing a balanced energy policy which has an “entrepreneurial flavour”[Wüstenhagen & Wuebker, 2011].

The three case studies reveal the delicate nature of reforming support for eco-innovation, as the cost of this support rises with greater uptake of renewable energy. In withdrawing the “protected space” [Jacobsson & Bergek, 2004] too sharply, policy makers run the risk of stifling the market for green start-ups. In a very significant more recent development in 2016 (following the collection of our data), the German Government has made concessions on the market-orientated reforms to support mechanisms in order to retain a “diversity of actors” in the German power market. These concessions show apprehension that the reforms aimed at market integration were jeopardising the entrepreneurial nature of the German energy transition and the German government is now modifying prior reforms in an attempt to retain the entrepreneurial strand in its energy policy. For policy makers in Britain and France, the fact that Germany has modified the reforms to retain actor diversity is thought provoking and could influence the trajectory of British and French reforms to their support mechanisms.

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