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Investment barriers under a renewable-electricity support scheme: Differences across investor types

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ABSTRACT

In 2012, Norway and Sweden implemented a common market for tradable green certificates to achieve each country's renewable-energy target. This is the first example of a cooperation mechanism that the EU has suggested to improve the cost efficiency of its renewable-energy policies. We asked investors in 446 planned hydropower projects in Norway what type of barriers may prevent their project from being realized under this scheme, and how likely it is that their project will be realized. Based on a regression analysis we find that the responses to these questions vary systematically with investor, project and process characteristics. We find that investors are concerned with capacity barriers imposed on the market because of the short duration and abrupt termination of the subsidy scheme at the end of 2020. Consequently, the cost efficiency of this and similar schemes can be improved by choosing a better design. Moreover, experienced investors and local landowners without previous experience in the energy sector responded differently to these questions. Local landowners were more optimistic, less concerned with capacity barriers and more concerned with economic barriers than experienced investors were. These observations are interesting given the recent emergence of new investors in the renewable energy sector.

1. Introduction

In January 2012, Norway and Sweden implemented a common market for tradable green certificates[1] to achieve at the least cost for society each country's renewable-energy target by the end of 2020. This joint support scheme is the first example of a cooperation mechanism that the EU has opened up for in Directive 2009/28/EC on promoting use of energy from renewable sources [7]. Based on a survey among investors in 446 planned hydropower projects in Norway we use regression analysis to formally examine the perceived barriers against implementing cost-effective projects by the deadline set by this scheme. Special attention is paid to whether such perceptions varied systematically between experienced and inexperienced investors when we control for other project characteristics. Identifying perceived barriers can help policymakers improve the design of future joint support schemes and reduce the extent of other factors that reduce the cost effectiveness of the scheme.

The potential benefits from coordinating support for renewable energy stem from a more efficient localization and composition of renewable-energy investments, reflecting differences in costs and market conditions. Directive 2009/28/EC suggests joint support schemes between member states (and between member states and third countries) which allow two or more member states to decide, voluntarily, to join or partly coordinate their national support schemes. In such cases, a certain amount of energy from renewable sources produced in the territory of one participating member state may count towards the national target of another participating member state.[2] The Directive includes a plan for a continuous evaluation of the cooperation mechanisms, in order to ensure that, together with the possibility to use national support schemes,

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[1] Other terms for the same concept are “renewable portfolio standard” (United States) and “renewable obligation” (United Kingdom).

[2] See Article 9–11 in Directive 2009/28/EC [7].

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those mechanisms enable member states to achieve the national targets by the end of 2020 on the best cost-benefit basis.[3]

Cost efficiency requires that the support scheme be broadly applied (that is, that it covers all renewable-energy technologies in a wide geographic area), and that the support scheme not favor any particular technology or renewable source by differentiating the support payment solely on the basis of differences in costs.[4] The Swedish–Norwegian common market for tradable green certificates meets many of these requirements of cost efficiency. The common market was implemented in 2012 and shall by the end of 2020 contribute to an increase in renewable-electricity production of 26.4 TWh in Sweden and Norway combined, equivalent to a rise of approximately 14% in total electricity production. Each country can count half of total production towards its national renewable-electricity target. There is no restriction on in which country the new capacity is located or on which technology or renewable source that is used. Producers are, in a period of 15 years, entitled to sell one certificate for each MWh of electricity produced from a renewable source.[5] In this period, they receive two streams of revenue, one from the sale of electricity and one from the sale of certificates. Distributors of electricity are required to buy pre-determined annual quotas of certificates for each MWh of electricity sold. The quotas vary over time and across countries to meet the two countries' joint target at the end of 2020. To balance supply of and demand for certificates, the sum of the electricity and certificate prices must equal the long-run marginal cost of the last producer to enter the market. Thus, in a perfect market, we would expect that the scheme stimulates investing in the least costly options first—including many hydropower projects.

However, market failure (for example, externalities, information asymmetry, transaction costs, non-competitive markets, time-inconsistent preferences and public good characteristics) may prevent cost-efficient renewable-electricity projects from being realized. Consequently, barrier removal includes "… correcting market failures directly or reducing the transactions costs in the public and private sectors by, for example, improving institutional capacity, reducing risk and uncertainty, facilitating market transactions, and enforcing regulatory policies" (IPCC WG III 2007, p. 810).

We examine whether a specific design feature, namely the way the scheme is terminated in Norway, contributes to or reinforces investors' perceptions of barriers and thus may reduce the cost efficiency of the Swedish–Norwegian joint support scheme. In Norway, the last plant to be entitled to sell green certificates must have started operation by the end of 2020; while, in Sweden, the number of years the generator could sell certificates is gradually reduced from 15 years in 2020 to 1 year in 2035. Because of the scheme's short duration in Norway (that is, 2012–2020), internal and external factors that delay the process (from license application until the power plant is operating) may prevent Norwegian hydropower projects from being realized within the scheme period. The short duration may also put pressure on limited resources like access to funding, transmission net and entrepreneurial services, regulator's handling of applications and capacity and competence within the firm to manage the projects. Last, but not least, as investors get closer to 2020, they may hesitate to invest because of the increasing risk of missing the operational deadline.

We also examine whether the emerging groups of new investors without experience in the energy sector form different perceptions of the potential for and barriers against their projects, all else being equal. In Europe, private individuals, farmers and community groups have invested in decentralized power production based on renewable energy. In Germany, more than half of all renewable-energy capacity installed in the electricity sector in 2010 was owned by private individuals and farmers [1]. In an empirical study [3], find that investors with no traditional background in electricity production have made the majority of renewable-electricity investments in Sweden. In Norway, local landowners (that is, farmers) have since 2000 invested in small-scale, run-of-the-river projects. As documented by Ref. [12]; differences in previous experience have affected actual investments in these projects; consequently, differences in previous experience may also affect perceived potential for and barriers against these projects.

Our case study can be compared and contrasted to a selection of studies on investment barriers to renewable-energy development. While our case study takes place in a well-organized and liberalized electricity market with a long history of using renewable sources for production of electricity, other case studies take place in countries in which little previous experience with renewable-electricity production, and inadequate organization of the marketplace may be the main source of many barriers against renewable-electricity projects (for example, [13,16,18,20–22,26]). While this literature points out how policy intervention can reduce market failure by providing adequate education, institutions and regulations, our study illustrates how policy intervention can sometimes increase market failure by contributing to additional risk and transaction costs.

While our case study focuses on cost-effective deployment of mature technologies, a major part of the literature on investment barriers has been devoted to emerging technologies and identifies policies, institutional factors, lack of information and knowledge and behavioral constraints that prevent adequate investment in the early stages of the technology innovation cycle (for example, [5,11,15,23,24]). This literature therefore concludes that using differentiated feed-in tariffs is the preferred support scheme (for example, [4,10,25]; while our focus on cost efficiency results in a preference for technology neutral support schemes and the use of cooperation mechanisms. Like Refs. [2,9] and [6]; we argue that there are considerable benefits from cooperation among member states on meeting the 2020 renewable-energy targets, and that countries that are not coordinating support for renewable energy might induce inefficient investment.

While we take the perspective of an investor and use regression analysis to formally examine the relative importance of different investment barriers, most of the studies mentioned above take a stakeholder perspective and use a qualitative approach to identify barriers. For instance [16], use stakeholder theory and a qualitative approach to examine the barriers identified by firms and stakeholder organizations in the renewable-energy sector in Queensland, Australia. They find that finance-related issues provided the most prominent barrier to the growth of renewable-energy supply, although access to infrastructure, technical issues and the regulation process were also important. Similar barriers are identified by Ozcan [20]; who assesses the effectiveness of the renewable-energy incentive system in Turkey based on interviews of 18 investors; the most important barriers are difficulties related to the permission and license processes and to connection to the grid. Ozcan [20] examines the relative importance of the barriers using frequency tables, cross-tables and a summary of Likert-scale

[3] See Article 23 on monitoring and reporting by the Commission in Directive 2009/28/EC [7].

[4] Differentiating the support across technologies or renewable sources may be consistent with cost efficiency under some circumstances, for example, if there are positive externalities like knowledge spillover from investing in innovative technologies.

[5] If the electricity is produced partly by renewable energy sources and partly by nonrenewable energy sources, the subsidy is adjusted to reflect the relative amount of renewable energy.