LEARNING BY DOING EFFECT FROM SOLAR PHOTOVOLTAIC RD&D

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Overview

This paper analyzes the 'learning by doing' and 'learning by research' effect from solar photovoltaic RD&D in Japan and Korea. Japan is a one of the predominant in photovoltaic market while Korea is one of the followers of the market. There are many different reasons to lead the production of new technology energies; government subsidies, technology development, and generation of the market. In this research focused on the government RD&D expenditure and technology costs.

The renewable energy technology costs are related to cumulative production, research, development and demonstration expenditures, and other institutional influences. To explore the relationship between RD&D investment, energy cost and market penetration, this paper estimates energy cost as a function of cumulative installed capacity (a learning by doing factors) and cumulative RD&D expenditures (a learning by searching factor). This study builds, in particular, on the Kouvatitakis et al.(2000) and Kobos et al.(2006) models, incorporating renewable energy technology database developed with IEA.

Methods

In the past, policy makers have estimated an RD&D effect as a constant percentage of total expenditures allocated to RD&D with a limited focus on the learning phenomenon. In contrast, Miketa and Schrattenholzer (2004), Klaassen and Miketa (2002), Kouvaritakis et al.(2000) and others explicitly incorporate R&D or RD&D expenditures into a two-factor experience curve in a similar manner to that of cumulative capacity in the one-factor experience curve.

Following equation illustrates the two factor experience curve relationship between cumulative capacity of technology $t(CC_{t,i})$ and cumulative knowledge stock of technology $t(KS_{t,i})$ on the per-unit cost $(Cost_{t,i})$

Taking the logarithm of this functional foam specifies both learning by doing (a_i), and a learning by searching elasticity (b_i). Estimation of the cost curves and resulting learning elasticity was based on the least-squares method of regression analysis. Sensitivities of the learning tastes for global wind and solar photovoltaic technologies to change in the model parameters are tested.

Expected results

Result yield experience curve parameters for cumulative capacity and RD&D expenditures, estimated with a both time lag between initial RD&D and first occurrence of cost reduction.The implications of the results indicate that institutional policy instruments play an important role for these technologies to active cost reductions and further market adoption.

References

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This work was supported by the New and Renewable Energy Program of the Korea Institute of Energy Technology Evaluation and Planning (KETEP) grant funded by the Korea government Ministry of Knowledge Economy (No. 20093021020020)