TECHNICAL CHANGE ANALYSIS AND TECHNOLOGY LEARNING CURVES: A NONPARAMETRIC FRONTIER APPROACH

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Overview

In recent decades, there has been a significant rise in interest around technology economics and innovation policy. In the case of energy technologies, some focus has been on the notion of learning curves. Learning curves are used to evaluate technical change as a consequence of innovative activities. The use of econometric techniques has been common to analyse learning curves and estimate learning rates. Learning rates serve to assess the reduction in the unit cost of production as a function of the increase in accumulated experience. However, the results of applying econometric methods are often constrained by small sample size and correlations among explanatory variables. Also, the obtained results are limited to measures of historical averages rather than capturing the path of technical progress.

Methods

This paper proposes a new approach to two-factor learning curves and innovation systems based on the nonparametric frontier technique Data Envelopment Analysis (DEA). This approach is illustrated in an application to two renewable energy sources: onshore wind and solar PV power technologies.

Results

Preliminary results show that in addition to accumulation of knowledge and equipment, there is evidence of technological progress that is comparable to the effect of factor productivity on economic growth. We compare the average of the obtained learning rates with those of parametric learning curves.

Conclusions

The paper shows that the average learning rates obtained from our approach are similar to those of parametric techniques while they produce more information on the progress path. The proposed approach can serve as a first step in applying nonparametric and frontier techniques to learning curves. There remains considerable scope for further work on obtaining more data and conducting more empirical tests.