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INNOVATION DYNAMICS IN THE EUROPEAN AND US ELECTRICITY SUPPLY INDUSTRY

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(1) Overview

The liberalization of the energy supply industry has been singled out as the most important factor that induced utilities' spending on research and development to drop drastically since the beginning of the 1990s (see e.g. Margolis and Kammen, 1999; Jamasb and Pollitt, 2009). However, our analysis of 15 European electricity incumbents shows that for the most recent four years, innovation efforts of almost all utilities in our sample have been constantly increased, and combined R&D expenses rose from €1,127 million in 2007 to €1,579 million in 2010.

Using an index constructed of publicly available data, we assess major players in the European electricity supply industry according to their innovation efforts, and compare the sample to the largest electricity generating companies in the USA.

(2) Methods

Following Schumpeter's view on innovation (Schumpeter, 1934), we extend the classic indicator of R&D expenses to measure innovation more holistically and adjusted to the specificities of the electricity supply industry. We identify three distinct attributes of innovation within an organization: (1) core research activities, as quantified by the relative importance, depth and diversity of R&D as well as patent registrations undertaken by electricity utilities; (2) efforts to integrate new and environmentally sound sources of energy and to minimize CO₂ emissions; (3) process innovation, as measured by the operative and sales performance of the companies.

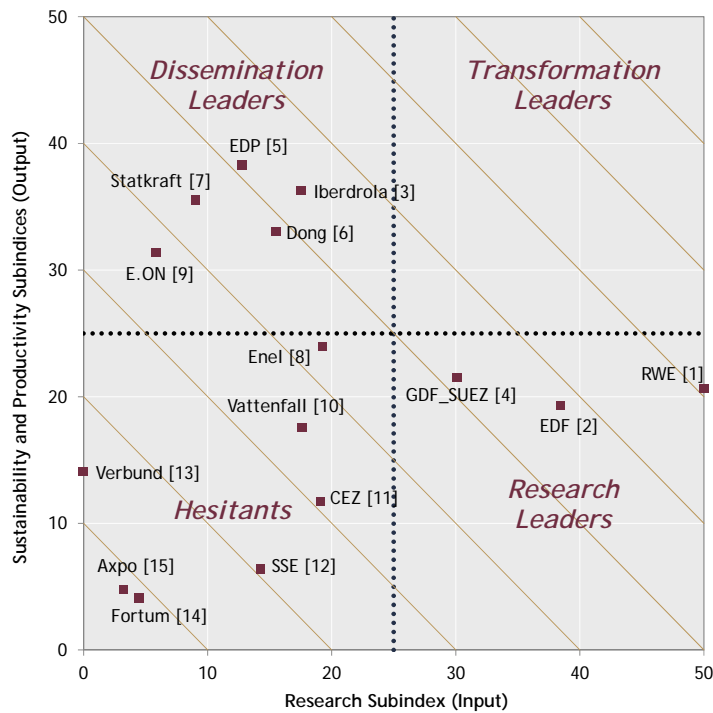
For the construction of an overall index of these attributes, all indicators are standardized, calibrated and aggregated (for a detailed description of the methodology, see Burger and Weinmann, 2012). Sensitivity analyses are performed to test the robustness of the index.

We have applied this methodology to a sample of 15 major European electricity supply companies and currently extend the sample to the 15 major investor-owned and private utilities (in terms of kWh produced) of the USA, using information provided by the utilities in FERC Form 1 (Level of Research, Development and Demonstration Activities), emissions and generation data by the Natural Resources Defense Council, as well as financial figures provided by the utilities.

(3) Results

With the help of the index, we identify diverging innovation strategies within the European energy industry: A cluster of utilities scores high in the Productivity and Sustainability Subindices. Those companies tend to exploit innovative processes and technologies developed by component suppliers that focus on machinery, electronics and information technology, and efficiently use and implement their innovations in the energy value chain without dedicating too many in-house resources to proper research (in our terminology "Dissemination Leaders"). By contrast, if companies yield high values in the Research Subindex, they pursue a strategy that aims to achieve future competitiveness by strengthening leading-edge know-how within their organization ("Research Leaders").

Figure 1: Transformation Matrix, ESMT Innovation Index 2010



Source: Burger and Weinmann (2012)

We observe in our sample of European utilities that none of the companies scores high in both facets of innovation. Preliminary data analysis of the US American utilities indicates that in North America even stronger emphasis is given on dissemination, while research activities are typically outsourced to dedicated research institutions.

(4) Conclusions

After years of declining R&D activities, consolidation and expansion, the electricity supply industry still lags substantially in terms of innovation needed to tackle the transformation of the sector towards a low-carbon energy supply. Nonetheless, innovation at least in the dissemination of technologies is not only induced by large utilities, but also some smaller players in the market.

(5) References

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