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Vertical disintegration in the European electricity sector: Empirical evidence on lost synergies

Klaus Gugler[a,*], Mario Liebensteiner[b], Stephan Schmitt[c]

[a] *Department of Economics, Vienna University of Economics and Business, Welthandelsplatz 1, 1020 Vienna, Austria*
[b] *Research Institute for Regulatory Economics, Vienna University of Economics and Business, Welthandelsplatz 1, 1020 Vienna, Austria*
[c] *WIK-Consult GmbH, Rhöndorfer Str. 68, 53604 Bad Honnef, Germany*

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ABSTRACT

The EU has been promoting unbundling of the transmission grid from other stages of the electricity supply chain with the aim of fostering competition in the upstream stage of electricity generation. At present, ownership unbundling is the predominant form of unbundling in Europe. From a policy perspective, a successful unbundling regime would require that the benefits of increased competition in power generation would at least offset the associated efficiency losses from vertical divestiture. Since evidence on this topic is scarce, this study helps fill this void by empirically estimating the magnitude of economies of vertical integration (EVI) between electricity generation and transmission based on a quadratic cost function. For this purpose we employ unique firm-level panel data of European electricity utilities. Our results confirm the presence of substantial EVI of 14% for the median sized integrated utility. Moreover, EVI tend to increase with firm size.

* Corresponding author.
E-mail addresses: klaus.gugler@wu.ac.at (K. Gugler), mario.liebensteiner@wu.ac.at (M. Liebensteiner), s.schmitt@wik.org (S. Schmitt).

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1. Introduction

Before the introduction of liberalization and regulatory reforms in order to promote competition in the European electricity sector, electricity utilities were generally regarded as vertically integrated natural monopolies. In the classical fashion, vertical integration of upstream and downstream operations was the predominant organizational form of an electricity utility to benefit from scope economies of vertical integration (EVI). A fully vertically integrated electricity company would encompass all stages from electricity generation to high-voltage transmission of electricity and local distribution, in conjunction with system operations, retailing to final consumers, and wholesale power procurement (e.g. Hunt, 2002). It seems natural that vertical integration exhibits cost savings through coordination advantages, sharing of information, use of common inputs, sharing of staff, efficient planning of investments, protection against uncertainty and financial risk, among other factors, which cannot be easily realized by unbundled firms (Jara-Díaz et al., 2004; Meyer, 2012a, 2012b).

Electricity is a particularly special good which includes some important characteristics: (i) on a large scale, electricity cannot be easily stored, which requires supply to meet demand at all times. Therefore, suppliers need to have sufficient excess capacities to meet peak demand. (ii) Electricity follows physical laws (Ohm's and Kirchoff's laws) and flows its way of least resistance. (iii) Usually, generated electricity has to be transported to customers via long-distance high-voltage transmission lines and locally via lower-voltage distribution lines (Arocena et al., 2012; Ramos-Real, 2005). Under these conditions, the supply of electricity is highly interlinked along the various supply stages and, accordingly, subject to coordination requirements (Gugler et al., 2013). Hence, vertical integration seems to be a more efficient organizational form in electricity compared to leaving the coordination of vertical supply to the market (Arocena et al., 2012).

In recent decades, the unbundling principle (i.e. vertical separation) has been put into practice in many economies around the globe. This regulatory measure aims at isolating some segments of the electricity supply chain which do not exhibit the usual properties of a natural monopoly (e.g. generation, retail) for the sake of eliminating anti-competitive forces and lowering the electricity price for end-consumers through increased competition (Fraquelli et al., 2005). The remaining segments – the transmission grid and the distribution lines – feature typical network characteristics associated with a natural monopoly and, thus, need to be regulated.[1]

However, a controversial debate has arisen whether the benefits of increased competition may be offset by potentially increased costs of utilities from unbundling.[2] The policy discussion has brought little attention to the fact that the regulatory measure of vertical disintegration comes at a cost, namely the destruction of vertical economies. According to

[1] For example, by introducing price regulation (grid tariffs) and third party access.

[2] Sappington (2006) discusses the benefits of vertical divestiture to maximize consumer welfare despite the presence of substantial vertical economies. Gugler et al. (2013) show that there is a trade-off between static and dynamic efficiency in this context.