



# Regulatory and ownership determinants of unbundling regime choice for European electricity transmission utilities

Alexis Meletiou<sup>a,b,\*</sup>, Carlo Cambini<sup>b,c</sup>, Marcelo Maserà<sup>d</sup>

<sup>a</sup> Joint Research Centre (JRC), Directorate for Energy, Transport and Climate, Via Fermi 2749, 21027 Ispra, Italy

<sup>b</sup> Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy

<sup>c</sup> IEFE, Bocconi University, Milan, Italy

<sup>d</sup> Joint Research Centre (JRC), Directorate for Energy, Transport and Climate, Westerduinweg 3, 1755 LE Petten, The Netherlands

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## ABSTRACT

One of the fundamental provisions of the European electricity directives is the so-called unbundling of structures and functions. Vertical disintegration with Full Unbundling (ownership unbundling or independent system operation) is considered an important step toward electricity market restructuring. While Full Unbundling (FU) models appear to be the most prevalent, several European countries adhered solely to less stringent forms of unbundling. Using a dataset of the 35 major electricity transmission utilities in Europe, this study provides an econometric analysis to understand the individual effect of regulation and ownership structure on the decision to adopt more stringent unbundling regimes. The overall results show that incentive-based or hybrid regulatory schemes and private ownership, are associated with a higher probability that a country will opt for FU.

## 1. Introduction

In the late 1980s, policymakers and academic experts largely agreed that the energy generation should be provided through organized and competitive markets, losing its monopoly status (Fox-Penner, 2010). However, the distribution and transmission segments of the industry remained as “natural” monopolies. This form of industry restructuring was known as “liberalization” or “deregulation.”

In Europe, the liberalization and restructuring of the electricity markets started mainly with the introduction of the European Union's first Electricity Directive (notably Directive 96/92/EC) on February 19, 1996. This first legislation package was followed by a second in 2003 (Directive 2003/54/EC) and a third in 2009 (Directive 2009/72/EC). The overriding goal of the three directives was to design an efficient, competitive, and sustainable energy market across the European Union (EU). One of the fundamental provisions of the three directives is the so-called “unbundling”: the separation of the market functions

traditionally provided by vertically integrated undertakings (VIU),<sup>1</sup> into functionally independent parts (Tanrisever et al., 2015). Various forms and degrees of unbundling are possible (Nillesen and Pollitt, 2011). The least stringent form is accounting unbundling while ownership unbundling is the most extreme. In between these two forms is legal unbundling; these are described in detail in the next section.

Since the first steps toward market liberalization in 1996, there has been debate over the “right” degree of vertical network unbundling to secure a level playing field (Brunekreeft, 2015). Initially, the first electricity directive involved accounting unbundling. Going beyond the provisions of the first directive, the second introduced a reinforced unbundling regime where Transmission System Operators (TSO)<sup>2</sup> had to be operated through separate legal entities when they were part of a VIU (legal unbundling). While the unbundling provisions of the first and second directives were accepted in their positive impact, European Commission (EC) proposed the third Electricity Directive<sup>3</sup> imposing

\* Corresponding author. Politecnico di Torino, Corso Duca degli Abruzzi 24, 10129 Torino, Italy.

E-mail address: [alexis.meletiou@studenti.polito.it](mailto:alexis.meletiou@studenti.polito.it) (A. Meletiou).

<sup>1</sup> Until the mid-1990s, electric utilities were, almost without exception, vertically integrated undertakings (VIU) and the main parts of the electricity supply industry, generation, transmission, and distribution, were operated by a single firm within their service area.

<sup>2</sup> According to the provisions of the first directive, a TSO can be considered as an entity responsible for operating, maintaining, and, if necessary, developing the transmission system in a given area and its interconnectors with other systems, to guarantee the security of electricity supply (EC, 1996).

<sup>3</sup> Hereafter, we refer to the third Electricity Directive 2009/72/EC as “the third directive,” the second Electricity Directive 2003/54/EC as “the second directive” and the first Electricity Directive 96/92/EC as “the first directive.”

minimum obligations on TSOs with regards to structural unbundling. Structural unbundling allows utilities choosing between two principal options: a Full<sup>4</sup> Unbundling (FU) model or an Independent Transmission Operator (ITO) model. FU provides for two conceivable options: ownership unbundling (OU) or an independent system operator (ISO).

Since the implementation of the first and second directives, a small number of countries have gone beyond the requirements of accounting and legal unbundling (LU) by implementing a FU model. At the same time, many countries have opposed stringent forms of unbundling in favor of legal unbundling (Van Koten and Ortmann, 2008). In the course of the third electricity directive, the countries were required to tighten the previous unbundling rules for transmission, choosing between the two principal options: a FU model or ITO model. Remarkably, some countries refrained from choosing FU models, although it was one of the legal alternatives; they opted instead for an ITO model, which amounts to a stricter<sup>5</sup> enforcement of the legal unbundling provisions that were already mandatory (Lindemann, 2015).

Motivated by the fact that some countries have chosen FU models while others an ITO or LU, we hypothesize that variation in the choice of structural regime can be explained in part by a set of diverse factors. This study is particularly concerned with the effect of the regulatory scheme and the ownership structure of the utility. Our analysis also controls for several other potential influences, including overall government effectiveness, socioeconomic conditions, and network and market characteristics.

Many studies focus on the choice of the ideal regulatory scheme following vertical disintegration of monopolies. Pollitt (2008) argues that ownership separation under specific models may require stronger regulation than under vertical integration or a legally unbundled TSO with significant government ownership of electricity assets. In this analysis, we treat “regulation” as a primary control variable. Russo (1992) demonstrates how regulation in the electric utility sector can influence the choice of governance structure, such as the level of vertical integration. More recently, Lindemann (2015), based on a theoretical analysis, argues that the decision to either implement OU or adhere to ITO model depends on the objective the regulatory authority determining the level of vertical separation. In a more general context, Green et al. (2006) and Pollitt (2009) note a strong correlation between the strength of the regulatory intervention and the progress with electricity reform in a given country. This study attempts to answer the question, “which regulatory scheme (e.g., cost-based vs. incentive-based) can create the most favorable conditions for the adoption of FU?”

Privatization and unbundling are usually closely interlinked (Hofbauer, 2009). Some privatization of electricity network assets has already taken place in Europe, but there is still relatively limited evidence regarding effects on unbundling decisions. The first European experience, in the UK, showed an apparent relationship between the privatization of state-owned electricity networks and ownership unbundling. On the contrary, the experience of Nordic countries showed that the full state ownership of electricity transmission networks might also facilitate ownership unbundling. In general, privatization changes the characteristics of owners and corporate governance, and affects responses to external factors, including capital markets (Jamassb and Pollitt, 2008). Heddenhausen (2007) qualitatively described the interdependence between liberalization and the privatization of formerly

<sup>4</sup> In the context of unbundling, the term “full” refers to a fully separated system operation from the ownership of transmission assets or to a fully separated transmission system ownership and operation from the commercial (generational and supply) business. We use the term FU to describe all of the variations of structural unbundling regimes implemented in the course of the first and the second directives. In the context of the third directive, the term is used to group two of the available unbundling options, namely the ownership unbundling (OU) and independent system operator (ISO) models. Further, we explain our decision to group the OU and ISO models in the Section 2.2.

<sup>5</sup> For more details regarding the strictness of FU against ISO, see Section 2.2.

state-owned utilities in four European countries.

Several empirical studies have assessed the impact of unbundling on consumer prices and investments, including those by Gugler et al. (2013), Nardi (2012) and Fiorio and Florio (2009). However, empirical analysis of the determinants of unbundling regime preference is scant. To the best of our knowledge, only Van Koten and Ortmann (2008) studied the effect of various control variables, primarily the corruption perception index, on the choice of structural regimes for the electricity transmission sector in Europe. Our paper adds to this literature in three ways. First, in contrast to earlier work, we use panel data from 1995 to 2016, which captures a longer and more recent period than previous studies. Second, we introduce key variables of interest, namely regulatory and ownership factors. Third, we use a large sample of 35 utilities,<sup>6</sup> from 28 European countries: 25 European Union member states (EU-25), Albania, Switzerland, and Norway.<sup>7</sup>

The paper is structured as follows. Section 2 discusses the different unbundling regimes and presents a review of the regimes implemented by European countries. Section 3 elaborates on the factors used in the quantitative analysis. Section 4 develops our main hypotheses and provides the data sources. Section 5 presents the steps of the analysis and discusses the results. Finally, Section 6 sets out the conclusions.

## 2. Transmission unbundling in the European electricity sector

### 2.1. Early unbundling: accounting, administrative and legal models

Toward the policy goal of market liberalization, the first step under the 1996 directive involved accounting separation. Accounting unbundling, which is the least stringent form of unbundling, requires electricity undertakings to keep separate internal accounts for each of their transmission and distribution activities, to prevent cross-subsidization. The internal accounts must include a balance sheet and a profit-and-loss statement for each activity. Although it was never officially recognized by EC energy legislation, a mixed form, “administrative unbundling” (AU), can also be distinguished. AU implies only accounting and/or organizational separation of generation and transmission activities. Organizational separation refers to separating operational and management activities for transmission and generation activities.

The second and more deliberate step towards market liberalization was legal unbundling under the 2003 directive. Legal unbundling (LU) requires transmission systems to be operated through separate legal entities when a VIU exists. In principle, legal unbundling means that the essential input must be controlled by a legally independent entity but a firm that is active in the downstream market is still allowed to own this entity. Ownership under legal unbundling entitles the downstream firm to receive the entity's profits, but interference in the entity's operations is forbidden (Höfler and Kranz, 2011).

### 2.2. Structural unbundling regimes

Although second directive provisions have raised the unbundling of network operators to a new level, in its sector inquiry of 2007, the EC argued that the development of competition in European energy

<sup>6</sup> Our dataset includes the major European TSOs and transmission asset owners, of each EU-28-member state, Albania, Switzerland, and Norway, which are also members of ENTSO-E. Our analysis excludes regional TSOs as well as the electricity utility from Malta. According to the Maltese regulatory authority, in Malta there are no transmission systems or TSOs; there is only an electricity distribution system covering the whole country (forms part of a VIU) (MRA, 2015).

<sup>7</sup> Albania, Switzerland, and Norway are three Western Europe states that are not members of the European Union (EU). Some studies suggest that the influence from the EU is evident, particularly in electricity policy and reforms, but parallels with EU member states indicate that non-membership of the EU, though influential, is not decisive (Bartle, 2006). The introduction of electricity reforms in the periods of second and third electricity directives in Norway and Switzerland respectively, also supports this conjecture.

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