WHY DOES AN EFFICIENT ELECTRICITY MARKET REQUIRE COORDINATION MECHANISMS BETWEEN POWER GENERATION, TRANSMISSION, DISTRIBUTION AND SUPPLY ACTIVITIES?

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Abstract

The unbundling principle is the core of the EU regulation of networks. But, is this principle economically sound? The answer is no. The existence of different kinds of interactions between the unbundled activities, which could be complementary or substituted, forbids us to accept the unbundling principle as true in any case (i.e. for all networks). The first goal of this paper is to show that the unbundling principle is not always viable, in the sense that, the unbundling of network activities introduces efficiency gains and losses. The demonstration is based on Cournot (1838), Baumol, Panzar & Willig (1982), N. Economides & Salop (1992), Gilbert & Riordan (1995) and Barale (2000,2002) papers. The second goal is to analyse the relevance of the unbundling of distribution and retail supply activities in the electricity sector which has been decided by the EU. The paper concludes with a discussion on the policy implications of these results.

1. INTRODUCTION

The people who contributed with the setting up of the deregulation in the EU, this deregulation which consisted mainly with the introduction of competition into network utilities, seem to have discovered risks that this new organisation will cause to our economies.

“It is clear that deregulation is a high-risk choice. Those jurisdictions that have not yet deregulated electricity generation need to think long and hard before they go ahead. Those that have done so need to figure how to minimize the downside potential of the journey on which they have embarked?” (P. Watts, 2001)1.

And these risks are important. The electricity sector has already shown us the inherent risks linked with this new organisation. An example of this is the high volatility of prices as well as an important risk of blackouts.

News dangers involving price and quantity appear, and we begin to hear speaking of regulation (instead of deregulation). How can we find solutions for these new difficulties?

The paper is organised as follows.

Section II shows that the unbundling of complementary activities is not always efficient in terms of social welfare and brings us to recommend to end with a systematic application of the unbundling principle when we want to reorganise a utility sector.

Section III recommends the setting up of an evaluating process of the efficiency gains and losses by the EU and addresses the relevance of the unbundling of distribution and retail supply
in the electricity industry. Empirical studies conclude that this unbundling destroys value from a social welfare point of view.

The final section deals with what kinds of coordination mechanisms are needed to trade off the failures introduced by unbundling.

2. WHY IS THE UNBUNDLING PRINCIPLE NOT ALWAYS EFFICIENT? ²

The opinion held by the EU is the following: the development of open market competition is the best way to achieve the creation of an efficient single energy market. And how can we introduce competition in a network utility? By allowing third party access to the network, which involves cutting up the sector into various activities, some monopolistic while others could be open to competition. This unbundling principle, on which is based the entire single market process, has been brought about by the new industrial economics. It is, quite simply, a basic principle. It is therefore extremely important to study its economical relevance. The question that needs to be answered is, will the unbundling of a sector utility lead, in all circumstances, to a greater efficiency for customers?

This study will show that the unbundling of a network utility will not necessarily bring a greater efficiency from an end-user’s point of view. It can even cause a loss of social welfare. In 1838, A. Cournot ³ established the following fundamental result: the competition between producers of intermediate complementary products is not socially efficient. This lesson known as “the double marginalisation problem” has since then been followed up by American economists ⁴, ⁵ who demonstrated that what is best for a business involved in complementary activities cannot be determined a priori. During an unbundling process of complementary activities, there are negative effects of the vertical unbundling and positive effects with the introduction of competition in certain activities. In other words, competition is not always the best means to allocate the resources when there are complementary interactions between goods or services.

2.1 Network industries as a system of complementary components.

“Many products have little or no value in isolation, but generate value when combined with others” (Katz, M., C. Shapiro, 1994) ⁶. These products are defined as complementary although they need not be consumed in fixed proportions.

Network industries are characterised by these kinds of strong complementary relationships. For example, bulk energy, transmission, distribution and retail supply are complementary inputs for the supply of electricity.

2.2 Competition and integration in a network industry.

A. Cournot considered the case where a final good (brass) is produced from two complementary components (zinc and copper) in fixed proportions. He compared two market structures. The first one is characterised by two monopolists that produce one component. In the second one, a single integrated monopolist is in charge of the entire production process.

He established that joint production of complementary components raises welfare in comparison with the case of separate production by two monopolists. He showed that the ownership by a single integrated monopolist reduces the sum of the two prices, relative to the equilibrium prices of the separate production case. In others words, the price of the composite good for end-users is lower under a vertically integrated market structure. This is because the two independent firms ignore the effect of their individual markups on each other, while the integrated monopolist internalises this externality.
N. Economides and S. Salop (1992) generalised the Cournot model to the case of multiple producers of differentiated brands of each component under the assumption that components are fully compatible and that the number of brands of each component is exogenous. Following Cournot, they compared two market structures: independent ownership and full integration. In the first case, each producer maximises its profit independently from the others. In the second case, a single decision maker maximises joint profit.

They showed that joint ownership internalises two externalities: the “vertical” externality among complements identified by Cournot, and the “horizontal” externality among competing products. Under different assumptions (full compatibility among components, zero marginal costs for all components, no price discrimination), they proved the existence a trade off between welfare gains from “vertical” integration and welfare losses from “horizontal” integration in the case of joint production compared to the case of separate ownership.

The explanation is the following: compared to independent ownership, joint ownership creates some downward pressure on price because of the “vertical” integration of complementary components and, at the same time, some upward pressure on prices because of the “horizontal” integration of substitutes.

To say it differently, it is not possible to define a priori which is the most efficient market structure when some components are complementary and others substitutes.

In the same way, R. Gilbert and M. Riordan (1995) established that unbundling introduces into regulation an additional component of information cost that is similar to “double marginalisation” in the monopoly pricing of complementary products. They concluded that unbundling may be advantageous only if it allows sufficient competition in competitive services, but there exists the possibility that the information costs exceed the benefits from the introduction of competition.

We can now understand how the New Industrial Economics has succeeded in establishing the “unbundling principle”. By ignoring the nature of the relationships that occur between activities (i.e. components). In particular, they ignored the complementary interactions. With this omission, it was easy to consider a total separability between activities, to identify separate markets and to apply the theory of contestable markets to each activity. In this context, the “unbundling principle” was promoted for all networks utilities.

The EU position which consists of using the unbundling principle for restructuring the main network industries ignores the existence of the efficiency losses introduced by the vertical disintegration.

3. APPLICATION: TO UNBUNDLE OR NOT TO UNBUNDLE DISTRIBUTION AND SUPPLY OF ELECTRICITY FOR SMALL CONSUMERS

The unbundling of distribution networks and retail supply has been decided by the EU. This decision was not based on an evaluation of benefits and costs.

It is interesting to note that some local authorities in the world have made some evaluations before unbundling distribution and supply activities. In 2002, for example, the State of Queensland in Australia decided to analyse the probable effects of the introduction of competition in its electricity retail market. The conclusions were that “the costs of Full Retail Competition clearly exceed the benefits”. So, the local authorities decided not to open the retail market.
3.1 The economical role of retailers

“Why do we need electricity retailers?” An interesting debate has opposed P. Joskow and S. Littlechild in 2000 around this question.

For P. Joskow (2000), the economical role of electricity retailers is very thin. In others industries, retailers exist because they add value a) by establishing convenient locations at which products are sold, b) by selling a wide range of complementary products and maintaining extensive inventories of several brands of each product in a single convenient location, c) by providing point-of-sale service to customers, d) by providing post sale service and return privileges, e) by passing along the benefits of any wholesale market buying power that a retailer might possess in the form of lower retail prices, f) by developing innovative retailing technologies that reduce retailing costs and allow retailers to transfer the savings to consumers and g) by developing a reputation for providing accurate information about product quality and delivering on promises about product attributes and post-sale service made to consumers.

Therefore, retailers exist because they are able to offer different value-added services to consumers. The kinds of services that can be offered vary from industry to industry. In the electricity sector, the capacity of retailers to provide these kinds of services seems very small due to the physical attributes of electricity (no storage and delivery through distribution networks, no product differentiation and quality linked to distribution networks). So, P. Joskow concluded that there is little social value in the electricity retail activity. “Electricity Service Providers are primarily financial intermediaries which acquire electricity in the competitive wholesale market and resell it at retail to residential, commercial and industrial consumers”. And until now, the electricity distribution companies have assumed this “basic electricity service”.

For S. Littlechild (2000), P. Joskow underestimated the role of retail competition in price formation, the importance of retail cost reduction, and the ability of retailers to provide variety and innovation.

3.2 Empirical studies

Some empirical studies, which evaluate the benefits from the opening of retail electricity markets in UK support the Joskow position. These studies carried out on this subject show us that at best, the benefit of introducing competition in the retail electricity market, with respect to small consumers, is low.

The National Audit Office (NAO), which oversees public expenses in the UK, examined the impact of electricity supply competition on domestic customers.

They evaluated that the annual reduction in electricity bills was £ 299 million per year.

Table 1 *Annual benefits from competition in electricity retail market in U.K.*

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<th>Benefit</th>
<th>£ Million</th>
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<td>Annual savings due to competition</td>
<td>143</td>
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<td>- 6.5 million customers changing electricity supplier</td>
<td>83</td>
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<tr>
<td>- 3.9 million customers with dual fuel discounts</td>
<td>54</td>
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<td>- 0.42 million customers switching to direct debit</td>
<td>6</td>
</tr>
<tr>
<td>Annual savings due to price caps (transmission and distribution)</td>
<td>156</td>
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<td>Annual savings</td>
<td>299</td>
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Source: NAO analysis.
Concerning costs, they noted that preparing the systems of the electricity companies for retail competition costs some £850 million and, Ofgem has allowed electricity suppliers to recover an average £121 million each year for seven years.

By comparing annual benefits and costs, the NAO concluded that introducing competition was efficient for small consumers.

This result is clearly contestable. G. MacKerron (2001), argued that some annual savings are not due to competition like savings permitted by price caps policy (m£156), and a part (one third) of savings linked to direct debit and to dual fuel discounts (m£20). The annual benefits from the opening of the electricity retail market is £123 million, this has to be compared with the £121 million noted above and add to this, the costs incurred by consumers to switch, £40 million

S. Thomas (2002) noted that if the UK wholesale electricity price has fallen by 35 per cent since 1999, the introduction of competition in UK retail market did not achieve the transfer of reduction price from wholesale market to retail market. This is an important point in regard to Joskow retailers' analysis which insist on the financial role of retailers.

3.3 A market design choice

P. Joskow, long before having started the debate on the importance of opening up the electricity retail market, considered two models of regulation for the electricity sector. In the first one, “the portfolio manager model”, competition occurs only in the wholesale market. The producers can sell their production to different clients (the transmission network, local distributors, large clients, traders and others producers). Here, physical and commercial aspects of selling electricity via the distribution network are not separated. It is important to note that, if the competition cannot take place between suppliers of kWh, it can come from new business models based, for example, on distributed technologies or energy substitution. The second one, “the customer choice model”, is the one that has been retained by the EU, where competition occurs both at the wholesale and retail levels.

Therefore, the limitation of unbundling does not mean the status quo or the refusal of competition, but a limitation of the introduction of competition (which is a means and not an end) to the only markets for which it is economically positive from a social welfare point of view.

4. A NEW EQUILIBRIUM BETWEEN COMPETITION AND REGULATION.

For D. Newbery (2001), “The new conventional wisdom is that network utilities should be unbundled, with the potentially competitive segments under separate ownership from the natural monopoly network…. But the new model has problems.”(2001). Therefore, the unbundling creates new risks. This is now generally agreed upon by economists, but these risks are not yet well identified.

One of the analytical difficulties is that risks are specific to each sector. In rail transportation for example, the main problems are probably the explosion of costs with the running of traffic due to the multiplication of actors involved, the security of the passengers and the investment policy. In electrical business, the main dangers can be the great fluctuations of prices as well as the system’s capacity to follow demand in the long term.

The argument of this paper is that a large part of these new problems is due to the break down of some coordination mechanisms of complementary relationships between the network components.
4.1 An important source of risks: the unbundling of complementary activities

An efficient electricity market requires coordination mechanisms between power generation, transmission, distribution and supply activities because these activities are highly complementary and constitute a system as a whole.¹⁵

Under vertically integrated monopoly structure, the planning between all the components of the industry is done by a single decision maker. This market design offers a stable equilibrium (D. Newbery, 2001).

Under competition market structure, firms are price takers in each market and the price mechanism provides incentives to invest or not. This last principle is not sound for networks. Networks are systems. “Networks display interdependencies such that the sum of the individual parts is not the same as the whole. Put simply, changing one part of a network can potentially affect all the others components” (D. Helm, 2001) ¹⁶. The incapacity of price system to take into account interdependencies between activities is a standard result introduced by J. Meade in 1952.¹⁷

Electricity markets have also a number of distinctive features that influence price formation which reinforce the coordination failure. In particular, electricity cannot be stored, demand is highly inelastic and spare capacities are needed to respond peak demand.

4.2 The regulatory challenge

Price systems are not able to take into account technological externalities. In others words, markets are not able to coordinate spontaneously a set of complementary activities. In this context, the regulatory challenge is to create new coordination mechanisms that permit us to take into account the existence of complementary links between various markets.

Network systems include infrastructure components and also operational activities. Then, the need of new coordination mechanisms concerns the entire industry production process and not only the infrastructure markets.

The governance of the electrical system is also more complex because of the increasing number of stakeholders.

In this context, the challenge for the EU is to find a new equilibrium between competition and regulation for each main infrastructure network. The application of unbundling, the nature of competition (by number or by comparison, for example), the kind of regulation process and the level of responsibility (national or European)¹⁸ should be the variables of the debate.
REFERENCES


2 BARALE, F. (2000): Critique de la nouvelle économie des réseaux et de son principe de séparation de l'infrastructure et des services, Revue d'économie industrielle, n°91, 1er trimestre.


