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**Retail Module:
the diversity of the actual Market Foundations.**

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Retail Module: the diversity of the actual Market Foundations

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Abstract

Creating markets in an industry having been monopolised and vertically integrated since decades can be a good test of what makes a market work. The work of continuously coordinating and implementing the innumerable exchanges of rights and of actual resources among millions of customers and hundreds of firms is the institutional backbone that supports the chain of transactions linking the wholesale and the retail businesses through the electrical grids. Electrical energy being a non storable commodity and being not traceable or individualizable between a given generator or supplier and a given consumer, the many tasks involved in the retail exchange of electrical rights had to be precisely allocated between private and public entities and authorities according to a common “retail exchange market design”. Our research will provide both some foundations and empirical characteristics of the main European “retail exchange market designs”

1. Introduction

Over the course of the past fifteen years, the electricity industry has experienced a series of remarkable innovations—in particular, the creation of open markets: first wholesale, then retail. These replaced the vertically integrated and quasi-integrated structures that had prevailed ever since the birth of this industry at the end of the 19th century. Few economists truly anticipated or forecast this revolution in electricity markets. The notable exception was P. Joskow, whose 1983 publication *Markets for Power* anticipated the opening of the English wholesale market in 1990 by a full seven years. The notion of a retail market for electricity had even less currency than that of a wholesale market. S. Littlechild, another economist and the British regulator from 1989 to 1998, merits being designated the “inventor” of the retail electricity market. Previously, this concept was so novel, so unfamiliar, that it is nowhere to be found in the 1988 *White Paper* with which the British Government prepared the way for the electricity reform, nor does it occur anywhere in the 164 pages of the 1989 Act. At that time, only a wholesale market for generators, distributors, and large industrial users was envisaged.

However, the most salient feature of this innovation was not simply the introduction of markets into the industry, but rather that their creation required so much institutional activism. The competitive reforms of the electricity industry literally consisted of elaborating gigantic and complex architectures for trading on markets—comparable in some ways to architects designing skyscrapers or engineers erecting suspension bridges. In no place were market forces harnessed to build “their” markets themselves. Consequently, electricity reforms are better characterised as “market design” than as “competitive opening”. W. Hogan captured it in one simple, short sentence: “*The market cannot solve the problem of market design*”.¹

Thus, we are confronted anew by a question that is representative of applied neo-institutional economics: What is meant by “*creating a retail market*”? Since the wholesale market already serves as a market for the commodity “electricity”, what specific role does the retail market play? Are the operations conducted on this retail market identical to, or different from, those on the wholesale market? Do the differences pertain to the object being transacted (= not exactly the same thing is traded)? Or are the differences rather procedural (= trades do not occur in exactly the same way)?

Wholesale and retail operations would indeed differ if the transactions conducted on these markets were not on the same commodities. This notion is already very present in business organisation practices and in the commercial strategies of wholesale and retail operators. As a rule, wholesalers add a few complementary services that are important to their clients to the output of the production process (= the producer’s good), thus providing an incentive for customers to buy from wholesalers rather than directly from the producers. Retailers, in turn, add yet more services, which may be complementary or supplementary, and in so doing create another source of value added for their specific category of clientele (A. Coughlan, E. Anderson and v.a., 2001). The upshot being that neither sells the same good (the same “set of characteristics”) as producers.

¹ W.W. Hogan, *Regional Transmission Organisations: Millennium Order on Designing Institutions for Electric Network System*, 2000.

Conversely, another take is that these two markets, wholesale and retail, essentially transact the same commodity, but do so in a different fashion. It is mainly the transactional procedures that differ. Here, wholesalers and retailers are viewed as market intermediaries. It is, in fact, intermediation services that they sell to their customers. These are typical of transactional services provided by “third parties” who interject themselves between producers and consumers when the latter find this arrangement preferable to engaging in a direct transaction (D. Spulber, 1999).

The goal of this paper is thus to identify how retail electricity markets are created, to define the essence of these market designs, and therewith to find a logical explanation for the space created for entrepreneur-retailers. To accomplish this, we first explore retailers’ involvement in the adaptation of the product between generation and consumption (Section 2), and then how the wholesale (Section 3) and retail (Section 4) markets manage transactions within the framework of their market design. Section 4 will illustrate a typology of “*retail market design*” using three examples of the creation of retail markets in Europe. Section 5 concludes.

2. Retailers’ involvement in adapting the product “electricity” between the generation and consumption stages

At its point of exit from the source (the production facility), a product may not necessarily possess all the characteristics that are of use to all consumers. It can subsequently be more precisely tailored to the needs of consumers by adding assorted complementary services. Specifically, these services may be: transportation and storage, classification and sorting, disassembly and reassembly, pairing with other products, and exhibiting to consumers.

The electricity industry does, indeed, make use of several of these adaptation services. Transmission substitutes, at least partially, for storage—which is economically not feasible—by tightly interlinking all generating plants within a zone, so as to make all power generated at any point within the zone permanently available throughout it. Since electricity is a highly normalised industrial product, and thus very homogeneous at the plant exit and on the transmission grid, it is not necessary to sort or categorise it. On the other hand, the disassembly and reassembly functions are very important and systematic. To render transmission economical, at the point of exit from the generating plant the tension of the electrical current is raised to levels much higher than are useful to consumers. Thus, at the downstream end of the transmission grid, the tension must be reduced to its consumption level. Furthermore, the transmission grid serves a very specific purpose—it is not designed to connect to all points of consumption. The link that carries the electricity to consumers’ homes is the distribution network. Finally, by virtue of this funnelling into households by an exclusive distribution grid, the product becomes permanently available to consumers, but it is now impossible to pair it with other goods.

We here see that the functions of adapting the product to consumers, after it leaves the generating plants, are highly industrialised and automated and that, furthermore, they are dispersed between the activities of the transmission and the distribution grids. However, none of these adaptation functions are actually performed by retailers. Thus, in the competitive electricity industry, the retailer does not directly play a role in adapting these characteristics of the “gross industrial” product to the

uses of consumers. So in this sense the retailer adds no value to the product (P. Joskow, 2000 vs. S. Littlechild, 2002).

3. How wholesale markets organise the exchange of rights on the commodity and the implementation of transactions

The concept underlying wholesale electricity markets is that several sellers will simultaneously face several buyers to offer them supply contracts. However, all these rights having been individually traded between sellers and buyers will ultimately be executed on the same shared grids and take the form of a single, collective form of power, the “electrical current”. This is why procedures for managing transactions are of considerable interest for understanding the creation of electricity markets.

When exchanging contracts for electrical energy, buyers and sellers find themselves in typical inter-individual relationships. However, at the time they seek to implement their contracts they enter into collective interactions. This is because the electrical current that flows from generating plants to consumers cannot be stored or divided into exclusive and transferable units. All injections and withdrawals are pooled in the shared flow of electricity that circulates through the grid. Thus, what we refer as “*the*” wholesale electricity market in fact consists of several complementary modules that trigger a sequence of operations as required for satisfying the claims on the commodity. This chain, by which transactions are implemented, includes at least three distinct modules. The first module handles the individual contracts between sellers and buyers. This is simply the exchange of rights (claims), and does not provide for the effective delivery of the corresponding product. The following two modules manage the actual, though collective, application of these rights (claims). The transfer of products corresponding to the rights and duties of individual contracts can only occur in a collective framework that manages all transfers at the same time.

3-1. The individual exchange of rights module

The most well-known module of the “wholesale electricity market” is the individual exchanges compartment, in which rights are negotiated between sellers and buyers—either bilaterally (OTC markets) or multilaterally (organised markets of the power exchange, or PX, type). However, after the conclusion of individual agreements, the corresponding actions on the commodity cannot be directly taken by the buyer-seller pair. This is because it is not possible to undertake direct inter-individual delivery on electricity transmission grids, since they are not “point-to-point” like communications networks. Since electrical energy is not storable, the right (claim) ceded by the seller is, at most, a “certificate” providing the right to withdraw, on demand, from the shared energy resources of the grid and covering a specified period or, at least, a commitment to compensate the difference between the price contracted *ex ante* and the real cost of the power.

3-2. The module that manages the collective feasibility of the individual exchanges

Since the commodity is neither storable nor separable into exclusive and transferable units, the execution of all individual exchanges occurs over the intermediary of the shared flow of power on the grid. Collective management of this process makes use

of a “*third party*”, the manager of the transmission grid, known as the *System Operator* (whom we will call *S.Op.* from here on). This third party played no role in the negotiation of the individual programmes, but has authority over the collective management of the corresponding shared energy flows.

The first order of business for this collective implementation is to ensure that the aggregation of the individual programmes is, in fact, feasible, given the grid’s capacity and security constraints. If forecasts indicate that some of these constraints may be violated, the *S.Op.* announces that the grid is “congested”. Consequently, some individual exchange programmes will be designated unrealisable, and these must be modified under the aegis of the *S.Op.*

Examining the interplay of the management of collective congestion and the operation of inter-individual transactions reveals at least four architectures for executing individual programmes.

1. Collective constraints can be managed with hardly any impact on the individual transactions negotiated *ex ante* between buyers and sellers, who were powerless to anticipate these constraints. To accomplish this, the *S.Op.* assumes certain generators’ commitments (being not feasible given the state of the grid) and obtains an equivalent output, from the perspective of the buyers, from other generators on a less congested part of the grid. The cost of this manoeuvre is subsequently spread over all participants in the wholesale market, curbing their unit cost. This class of collective management operations may be called *redispatching* or *countertrading*, depending on the exact details of the procedure. We observe that this process assigns greater weight to supply contracts that are negotiated individually *ex ante* than to the constraints and collective costs of implementing them *ex post*.

2. Conversely, we can oblige contracts that are negotiated individually *ex ante* to account up front for the constraints and collective costs of their future execution. If this *ex ante* internalisation of collective constraints occurs on an organised market (PX), it takes the form of direct incorporation into the prices and volumes of inter-individual exchanges on the market. As a result, only operable individual contracts are exchanged *ex ante*. This internalisation of collective constraints into individual exchanges can be exhaustive if the *S.Op.* and the PX collaborate closely to identify the contribution to the congestion from each elementary unit of the grid (= each of its hundreds of nodes). Thus, the term “*nodal pricing*” is used to describe this way of managing collective constraints.

3. The internalisation may also occur at a much higher level of aggregation, so that only a few broad zones are differentiated and becoming autonomous sub-markets of the same PX. The threshold for the volume of exchanges between zones at which the PX is splintered into sub-markets is set by *S.Ops.* They behave as if the impact of each zone on the collective constraints was homogeneous, and all traded contracts are thus realizable. This maintains sufficient liquidity on each sub-market of the PX to ensure that there is a single energy price throughout the zone. Consequently, this way of managing collective constraints is called “*zonal pricing*”.

4. Finally, there exists yet another means of *ex ante* internalisation of grid constraints on either bilateral (OTC) markets or organised (PX) markets that does not require an *ex ante* coordination of markets with the *S.Op.* In this fourth category of collective constraint management strategies, it is the *S.Op.* who makes her own *ex ante*

commitment to guarantee that a firm capacity will be available on a given segment of the grid and sells it off at auction. Thus, the grid is *de facto* divided into zones, but these zones are only delineated by virtual entry and exit points, or *gates*. Here S.Ops. are acting like traditional road, railway, or air transporters. They are not directly involved in the collective adaptation of individual energy supply contracts on either side of the gates. Rather, it is incumbent on sellers and buyers to separately and independently arrange their contracts on the basis of what they can foresee in terms of common consequences solely from the signals yielded by the capacity auctions.

Thus, we observe that the diversity of market designs corresponds to different architectures for negotiating and implementing energy transactions. These designs differ in how individual programmes of exchange are negotiated (cf. *bilateral vs. organised markets*) in the first instance, and then in the provisions for rendering these individual programmes compatible with collective constraints during their execution (*ex post* redispatching arrangements, *ex ante* nodal, zonal, or capacity auction arrangements), in the second instance. All these designs also define the role of a third party, the S.Op., who appears as the central agent for the collective implementation of the claims acquired during the individual exchanges.

3-3. The module for collective management of uncertainty in individual programmes (physical clearing and financial settlement)

The execution of individual programmes is not only subject to uncertainty attributable to collective constraints on the grid. A further category of uncertainty arises from the individual conduct of buyers and sellers. Will they strictly adhere to the exchange programme they agreed to? Or will they digress from it, for any reason whatsoever? In principle, in most other industries any divergence of buyers and sellers from a contractual agreement is a matter strictly between themselves. This cannot apply to the electricity sector, owing to the fact that this commodity is neither storable nor divisible into exclusive and transferable units, so the shared flow of power is immediately influenced by any individual deviation from the programmes.

To ensure the overall feasibility of the individual programmes, the responsibilities of the S.Ops. also extend to managing the continuity and quality of the shared flow of power. To accomplish this, they administer an ongoing service of adjusting the flow of electricity on the grid, reacting every ten or fifteen minutes to continual fluctuations in injections and withdrawals. This is possible because they have access to generating capacity that is held in reserve and ready to kick in, as well as a rapid source of power (upward or downward)—this arrangement can be called “*balancing*”, for short. Though this service was originally conceived as a network reliability feature during the era of vertical integration, it clearly functions as an energy market today, during the era of open markets. It is, in fact, the only real trading place for physical energy, since all inter-individual negotiations that precede the opening of the “*balancing*” only actually deal with promises for future delivery, and not with the direct exchange of a product that is available immediately.

In an open-market context, the S.Op. cannot manage a “physical” energy market without billing the users directly for this supply. For obvious reasons of incentives, it is necessary that the costs of individual deviations from the exchange programmes be assumed by those who cause them. This cost cannot be socialised, as in some of

the formulae for managing congestion. However, to be able to charge this balancing to those who are liable for it, it is necessary to be able to record all individual deviations from the injection and withdrawal programmes. Thus, all private programmes need to be collected—in principle, one day ahead. It is also necessary to have a complete series of physical measurements of individual injections and withdrawals operated on the grid over the day. Since the price of electrical power is determined on wholesale markets every hour or half-hour, individual physical metering must be performed by special meters with the same degree of precision. This is true for both generators and buyers. Consequently, the S.Op. must conduct a full physical accounting of the compensating operations of the grid users' programmes and the suppliers of balancing services. This physical clearing of wholesale market transactions allows the collective implementation of individual transactions to be concluded. Thanks to physical clearing, the S.Op. can initiate financial settlement of individual deviations. This completes the collective framework for individual transactions.

Being responsible for the provision of balancing power, the S.Op. is in charge of both a clearing service and a settlement service. These two services, which are founded on accounting and measuring individual exchange programmes, constitute the core of this second and last module of collective implementation of the wholesale transactions.

3-4. The articulation of the wholesale markets' architecture around a shared measurement system

The interface that links the three modules required for implementing the wholesale transactions is known as the “architecture” of wholesale electricity markets. In principle, buyers and sellers cannot anticipate *ex ante* the *ex post* feasibility of their individual transactions without the intervention of a third party, the S.Op., who functions as the true “architect” of the markets. Similarly, sellers and buyers are in no position to manage the uncertainties associated with their individual injections and withdrawals in an exclusively bilateral fashion. Therefore, the collective management activities of the S.Op. are indispensable for implementing the individual transactions—not merely supplementary services that add some product value; except *reliability* which is really valuable but not necessarily priced. While several market designs are possible, and hence several operating modes for S.Ops., all of these market designs are, in fact, mainly institutional infrastructures for executing individual transactions on the wholesale electricity market. We here have a striking illustration of what R. Coase was talking about during his Nobel Prize acceptance speech: “*The Institutional Structure of Production*”.

Nonetheless, the fact that a designated third party, the S.Op., manages this collective infrastructure, this “*governance structure*” of the market (O. Williamson, 1985, 1996), does not invalidate all wholesalers' economic functions on wholesale markets. They still play a role in the elaboration and administration of purchase and sales contracts.

During the establishment of contracts on PXs, traders can intervene between generators and buyers and play the traditional role of “*price makers*” by exploiting the existence of a “purchase price/sales price” spread with their ability to understand or anticipate market movements, or to arbitrate differentials within the market. Outside of PXs, brokers can offer traders similar opportunities on the bilateral market (OTC).

All these electricity trading activities can include transactions that internalise the collective constraints on the grid *ex ante*.

Similarly, “*aggregators*” of individual power exchange programmes (in France they are called “*responsables d’équilibre*”) may intervene between buyers and sellers to aggregate the individual programmes before submitting them, at D–1, to feasibility control by the S.Op. This position of intermediary also allows aggregators to conduct an initial, private, clearing of their clients’ imbalances prior to addressing aggregate physical clearing and financial settlement with the S.Op.

The two typical functions of wholesalers, namely trading and the aggregation of programmes, can also be accomplished by generators (upstream integration) or large consumers (downstream integration: e.g. Norway’s Norsk Hydro in continental Europe). Up- or downstream integration of these wholesale activities, by producers or consumers, does not affect the function of the transaction. Trading and programme integration are activities that are typical of market intermediaries who capitalise on their knowledge of the market, on economies of scale, or on the frequency with which they repeat transactions to reduce transactions costs.

The functions of the S.Op. and of the wholesaler are thus complementary. Wholesalers manage private units of transactional services and the S.Op. manages the collective infrastructure for all transactions. However, the two roles are not symmetric. The creation of the S.Op. and a market architecture is an absolute prerequisite for the existence of a wholesale market, while independent wholesalers can be dispensed with. Nonetheless, despite the absence of symmetry, there still exists a pronounced mutual interdependence around a shared measurement system.

On one hand, S.Ops. would be utterly incapable of carrying out their collective duties if most of the transactions on wholesale markets, bilateral or organised (PXs), were not already semi-aggregated by several dozen wholesalers—vertically independent or integrated—who bring their credibility to the table as intermediaries by assuming responsibility from a business and financial perspective. On the other hand, S.Ops. would be unable to accomplish their clearing and financial settlement tasks without access to private data pre-formatted for these calculations. Even assuming that all generators are directly hooked into the transmission grid (which is not always the case), and that their injections are thus directly measured by the S.Op., it would remain necessary to have access to hourly (of half-hourly) meter readings of individual consumption and to group them aggregator by aggregator. To allocate these individual readings to the aggregators, a pre-configured registry identifying the affiliation of each consumer with an energy seller would be needed. In practice, the performance of collective tasks by S.Ops. thus presupposes that they can make use of large amounts of private data from metering systems. Consequently, there is a great deal of interdependence between the two systems for monitoring transactions information, private and collective.

4. How retail markets organise the exchange of rights and the implementation of transactions

What else is required for the exchange of rights between sellers and buyers on the retail electricity market, and for implementation of these transactions, that cannot already be found in the architecture of wholesale markets? It is not some requirement

to adapt the commodity “gross electricity” to the needs of individual consumers, since we know that this is automatically done by transmission and distribution grids. Nor is it any inability of wholesale markets to handle individual consumption data, since we know that the functions of the S.Op. and the wholesalers are articulated around a shared metering system. However, from the perspective of the wholesale market, the structural particularity of the retail market—and its Achilles heel—is this measurement system.

Of course, orders of magnitude separate the measurement system that manages several hundred or thousand large corporate consumers from one that manages millions and tens of millions of consumers in the mass market. But this distinction does not necessarily imply a structural difference between wholesale and mass markets. The structural constraint on the wholesale market is that the data communicated to it must be formatted according to its own rules of operation. In particular, it assumes that meter readings of individual consumption are taken hourly (or half-hourly) and that all these individual volumes are assigned to the various aggregator accounts to ultimately yield physical clearing and financial settlement.

Then the essence of market design for the retail market is the organisation of its measurement system, since this constitutes its interface with the two modules of collective governance of the wholesale market. Consequently, we find there are four potential architectures for retail markets, which are also variants on their market design. In the first variant, the retail market is not really distinct from the wholesale market, since they both share the same hourly metering system for individual consumption. Things are very different for the three other variants. None of them feature the hourly metering system of the wholesale market, but rather consumption approximations computed from profiles of demand “proxies”, simply known as “*profiles*”. These measurement proxies are applied to consumption volumes that have been accurately metered, from the perspective of the wholesale market, but that apply to a very large number of consumers who are the customers of different sellers. It is with the “border effect” (resulting of the design of the zones for which these measurement *proxies* are computed) that these three variants of profiling within the retail market design differ.

4.1. ‘Nodal’ Retail Design

The first variant of the retail market is a simple internal compartment of the wholesale market, since their measurement systems are identical. Each consumer is equipped with a smart meter. This counter transmits hourly (or semi-hourly) consumption data to a database that allocates it using a registry matching consumers’ affiliation with sellers. With this type of system, no equalization between consumers, sellers, aggregators is required for the S.Op. In an analogy with the terminology of wholesale market design, this could be called a “*nodal measurement system*” (= each consumption node is metered individually and can be handled independently of the others). This specific type of retail market appeared subsequent to the introduction of competitive electricity reforms. It was, in fact, not distinguished from the wholesale market as such, until questions arose concerning the barriers to entry for small-scale consumers raised by the cost of metering equipment.

4.2 'S.Op' Retail Design

In the following three variants, the retail market is distinct from the wholesale market because its measurement system is different. Rather than proceed with hourly metering of individual consumption, volume approximations are computed from demand curve “types”, or “profiles”. These profiles serve as keys for allocating hourly volumes of global consumption that are not based on individualised data. These global volumes are computed from the perspective of the wholesale market, but they sum over very many consumers who are clients of different sellers. Underlying this system of profile-based metering is a systematic equalisation between consumers said having the same profile. It may also involve transfers between profiles. Thus, several types of cross-subsidies are effected between consumers, sellers, or aggregators when treated by the S.Op.

In the first of the three profiling variants, the allocation keys (the *profiles*) are computed on the same scale as the clearing and financial wholesale balancing operations. They are performed by the S.Op. or an equivalent agent. While distinct from the wholesale market, this type of retail market still functions as an approximation to it, since the proxies sent to wholesale clearing and financial settlement are computed on the same scale, sometimes even by the same services. The logic underlying this design is that the retail market is treated like a single zone of measurement proxies for the wholesale, rather than as an accumulation of local markets.

This retail market design closely corresponds to the case of England and Wales. While the defunct compulsory wholesale market (the Electricity Pool) was not responsible for the overall architecture of the retail metering system, it profoundly affected the clearing and settlements system. In addition, the profiling standard (which is based on eight domestic consumption profiles), was designed by the British Electricity Association, and each year the forecasts of electricity consumption are updated for each profile on the basis of real data from the year Y-2 (Maclaine, 2003).

4.3 'Zonal' Retail Design

Conducting profiling on the same scale as the wholesale market—as in “*S.Op. retail*” design—is, in fact, a very particular choice, since all elementary data necessary for computing the profiles are collected on a more disaggregated scale: the local level. Locally, that is on the level of the distribution grid or the supplier at the point of consumption, one can maintain a registry of consumer-supplier affiliations (updated when a consumer changes supplier), one can conduct precise hourly metering of the global consumption of a population of profiles, and one can also perform periodic metering of actual individual consumers within the population of profiles. Finally, by combining these various data, one can refine or rapidly adjust the profile definitions, or conduct various operations to reconcile the data.

However, when that much emphasis is placed on the local scale, where the data are directly accessible, the market becomes highly splintered in terms of calculating profiles and settlements. These profiles may be “closer” to the consumers or the places of consumption, but they also become “*zonal*” profiles for purposes of “*zonal*” settlements. The national consumption-profiles market dissolves into a collection of

proxies embedded in various zones—zonal profiles—with a non-negligible potential for border effects between the zones.

One can, nevertheless, mitigate these potential border effects between local profiling zones by adopting common calculation methods as well as a shared interface for querying and exchanging data. Consequently, in an analogy with the terminology of wholesale market design, this could be called a “*zonal metering system*”. Each consumption profile is metered and handled within a single distribution zone, but since all zones apply open and equivalent procedures, it is no gross exaggeration to state that they tend to function as a common infrastructure for the interface between the retail and the wholesale market.

This type of retail market design corresponds to the case of Norway, where each distribution grid computes a single consumption profile for its zone and then directly derives the settlement owing from each supplier. While this profiling standard, with a single consumer type in each zone, appears very simplistic, that fact that it is updated weekly goes some way toward mitigating its inherent lack of precision. Finally, on the national level, this methodology is framed by the regulator (NVE 1999), while a common national system for querying and transmitting data (EDIEL) facilitates exchanges between all suppliers and all distribution grids.

4.4 ‘Borders’ Retail Design

When local distributors are collecting data, computing profiles, or determining the corresponding settlements, they may have no obligation, incentive, or inclination to adopt common procedures or to converge toward a shared data query and exchange protocol. Thus, it is possible for border effects between “retail zones” to be of the same order of magnitude as those between non-coordinated wholesale zones. Moreover, it would be inappropriate to designate these local entities as “zones” of a retail market, since each one is, in fact, a self-contained retail market. It is the extent of border effects between profiling zones that motivates the division into “local” retail markets. Thus, we can define this retail design as a “*measurement system with borders*”. Consumption profiles are, in fact, measured and handled differently within each zone. There are no open and equivalent procedures that might constitute a common articulating infrastructure between these various retail markets and the wholesale.

This type of retail market design corresponds to the case of Germany, where each distribution grid has its own approach to computing consumption profiles for its zone and then dictates the settlement due from each supplier. In the absence of national regulation and a national regulator (until 2005), only voluntary participants (including the four largest generators-transmitters) subscribed to a shared protocol for computing and exchanging data. While approximately 80 per cent of local suppliers/distributors retain retail practices that are essentially local (C. Müller, 2005).

5. Conclusion

The goal of this paper has been to identify how retail electricity markets are created, to define the nature of their market designs, and therewith to find a logical explanation for the space created for entrepreneur-retailers.

We can, in fact, ask what is meant by “*creating a retail market*”, since the wholesale market is already a market for the commodity electricity. Of course, the assumption is that the retail market will conduct operations that differ from those on the wholesale market. However these differences can bear on the object of the transaction (exchanging differentiated goods), or rather on procedures (differentiated market mechanisms).

We have observed that retailers do not play any significant role in adapting the electrical commodity between the stage of generation and that of final consumption, and that adaptation of the commodity is automatically performed by the transmission and distribution networks. We have established that the core of the market designs consists of the layout of a chain of transactional modules necessary for implementing the rights (claims) exchanged: (1) a module of inter-individual transfers of rights between sellers and buyers (with trade places that are bilateral [OTC], or organised [PX]); (2) a module for the collective management of the feasibility of individual exchange programmes (congestion management); (3) a module for the collective management of uncertainties involving individual conduct (imbalances management, clearing, and settlement). Within this institutional architecture, it is a common third party (the System Operator) who manages the collective part of the transactions governance structure. All the while market intermediaries (wholesalers) sell private services to facilitate transactions (notably trading and programme aggregation). Between the common third party and the private intermediaries there exists an extensive interface over a measurement system that allows monitoring and executing individual transactions within the externalities-rich context of the grid.

Retail market design is one particular derivation of this interface which coordinates private intermediaries and a common third party around a measurement system. It specifically deals with market situations in which the consumption of individual consumers is not metered, though they maintain direct access to the shared resource—the electrical current. Thus, new types of market design appear with retailing. They are characterised by the introduction of proxies (profiles) into the measurement system to support the collective implementation of individual transactions.

On this new type of market, retail market intermediaries (retailers) sell private services to assist their customers’ transactions. Like wholesalers, they also sell trading and programme aggregation, but they add services that are typical of electricity “retailing”: demand aggregation (which opens access to trades on OTC and PX wholesale markets) and data processing logistics—which notably begins by registering customers within a proxy measurement system and which ends with...sending them the bill.

Empirical evidence shows that around and under the new “doors for competition” several layers of hard institutional foundations have had to be built. It first covered the definition of rights and duties of generators, of transmitters, of distributors, of traders, of suppliers and of consumers having to result in a feasible set of exchangeable rights. It then needed a chain of control of the consistency of individual rights and of registering and clearing of the uses of these rights. It assumed that commercial and financial consequences of these uses can be identified, measured or proxied and assigned to any user according to defined circumstances of her individual use.

References

Apology: *Still to be made.*