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The prospects for smart energy prices: Observations from 50 years of residential pricing for fixed line telecoms and electricity

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ABSTRACT

This study focuses on how energy and communications have evolved over the last 50 years and what we can learn from history in order to examine the prospects for smart energy pricing by 2050. We begin by discussing the nature of energy and telecoms products and why price discrimination should be expected. We then review various business and pricing strategies that have evolved in the two industries. We find that business models for both the telecoms and energy sectors have changed from the traditional services business model (i.e., offering of calls and messages for telecoms, and utility supply services for energy) to more dynamic, integrated and complex business models. These new business models include the managed services provider model, the bundled services model, and the prosumer business model, among others. Similarly, several changes in pricing structure have evolved. There has been a reduction in the number of distanced-based and increasing time-based price differentiation in fixed line telecoms and the abolition of residential floor area-based differentiation in electricity pricing. We conclude with a discussion on how the rollout of the next generation of electricity meters (smart and advanced meters) may further shape electricity pricing in the future.

1. Introduction

Active consumer participation is essential for harnessing demand flexibility, improving the integration of intermittent solar and wind renewable energy resources and achieving low carbon power systems without excessive costs related to network reinforcement and the provision of reserve generation and storage capacity. With an increase of renewable generation integration, demand flexibility can significantly improve the viability and value of renewable generating resources [1]. The seminal work by [2] on spot pricing of electricity discusses responsiveness of demand as being the best remedy for market power that generators may have. One way to achieve this active consumer participation is through smart energy pricing – the pricing of energy in real or near-real time – made possible by effective data communication between suppliers and consumers.

Potentially, smart pricing can promote the use of dynamic pricing (i.e., time of use pricing), and can trigger or improve efficient energy use among consumers. Consumers' response to smart pricing such as real- or near-real time tariffs can further be promoted by smart appliances, which can be connected to a system that remotely controls the operations of such appliances with minimal or no end-user intervention. Although it is expected that increasing automated smart appliances and introducing more smart energy pricing (e.g., implementation of more real/or near-real time prices) could potentially raise consumer response/engagement, consumers' concerns about the privacy of smart appliances remain [3]. However, addressing consumers' concerns plus improvements in technology in the future might be expected to further improve the roll-out of smart prices.

Smart pricing is about information and involves the integration and/or reinforcements of energy networks with information technology. Thus, it is important to review the evolution of price changes in telecoms vis-a-vis the energy pricing in order to examine the prospects for future smart energy pricing. This paper reviews the evolution of price changes in residential fixed line telecoms and electricity in the last 50 years and what we can learn from history in order to examine the prospects for smart energy pricing by 2050, based on past behaviour of firms and their customers. We centre our discussion on the evolution of residential fixed voice telecoms and electricity pricing in London. This

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study is structured as follows: the next section looks at the nature of telecoms and energy products that allow for price discrimination. Section 3 reviews various business models and pricing strategies that have evolved in the two industries. This is followed by a brief discussion of methodology. Section 5 discusses the changing structures of residential electricity and fixed line telecoms pricing in London from 1960, while the last section concludes.

2. Theory of pricing

Pricing is an important element of marketing because it determines what a firm would receive in exchange for its product or service. Pricing constitutes the only profit-generating element of the four Ps of marketing mix.[2] Because consumers' wants or desires can be converted into effective demand only if they have the willingness and ability to buy the product, pricing becomes a very important tool in marketing. A pricing strategy refers to the process of selecting an appropriate price for a product for the purpose of achieving a firm's objective. According to Tellis [4, pp.147], "a pricing strategy is a reasoned choice from a set of alternative prices (or price schedules) that aim at profit maximization within a planning period in response to a given scenario". This definition implies that a firm may have a different set of alternative pricing choices, but it has to decide on the best pricing option(s) that would satisfy its objective given a particular circumstance – a firm may adopt a combination of pricing strategies.

In theory, differential pricing is to be expected in telecoms and energy because of the time and place varying nature of demand. In telecommunication networks, components and facilities are geographically located in relation to final consumers, and time of demand often varies from one consumer or one geographical area to the other, which often involves varying costs of service delivery. Similarly, energy networks are located on the basis of the geographic positions of both energy sources and of final consumers. Because energy services must be produced in (near) real time and are largely non-storable, energy (electricity and gas) service companies have to supply different locations, and at different times. The need to efficiently supply a time-varying demand would require a balancing of production across several generating units having different capital/fuel cost ratios.

Moreover, both (telecoms and energy) services are capital intensive, with large fixed costs that have to be recovered. The capital-intensive nature of the industries means that service providers need to recover the fixed costs of the network without undermining scope and scale effects. Thus they must design an appropriate pricing system. In designing appropriate pricing to recover these costs, there are a number of options available for service providers: they can charge a fixed sum for network access independent of consumption (e.g. by charging everyone equally regardless of consumption); they can charge consumers progressively based on their consumption and time of demand; they can charge (some) retail consumers more in line with Ramsey pricing (by taking into consideration the variation in customers' price elasticity of demand); they can use two part pricing (comprising a fixed lump sum and a 'pay as you consume' portion); or charge time varying tariffs.

Notwithstanding the similarity between the two sectors, there are potential differences between them, which suggests that time of use and greater use of differential pricing would be expected to be of greater value in the electricity sector. Unlike energy services, telecoms services have very small variable costs because production facilities have well-determined capacities, and the costs of operation do not necessarily reflect the flow of services through those facilities [5]. "Due to the extensive use of electronic components [in telecoms], maintenance and energy costs are mostly the result of simply operating a facility and are nearly independent of its actual use" [5, 1991: pg. 9]. By contrast, the short-run marginal costs of generation is dependent of the (costs of) energy used by the generating unit, this marginal costs varies significantly in time and space. Apart from the volatility in fuel prices, meeting peaking energy demand commands greater marginal/variable costs as less efficient and expensive (generating and distribution) facilities are operated in order to meet consumer needs. That said both regulators and consumers might be more willing to allow and accept price discrimination in telecoms. Given the presumed future convergence of telecoms and electricity sectors, the evolution of price structures in telecoms would seem to be highly instructive for electricity.

Through improved technology and advanced business support system, telecoms has (had) the ability to gather real-time data on usage patterns, by being able to 'plug' directly into what the customer is doing and plotting this against pre-contract service level agreements. The ability to gather real-time data on usage patterns through these technology and software, has resulted in communication service providers being able to accurately bill their customers. By learning from telecoms and through the use of smart grid, and smart and advanced smart meters, the energy providers can gain real-time usage information relating to gas and electricity, feeding this into the billing platform for accurate pricing based on value, volume, time and duration of use. An understanding of the real-time congestion management system in the telecoms can also assist energy providers to deal with the multitude of traffic that will be passing through the smart grid. Moreover, the telecoms industry has developed the potential of treating customers as individuals, through the provision of tailored pricing tariffs that cater to a variety of usage patterns. By better understanding the billing developments that have evolved in the telecoms market, energy providers will be better-equipped to offer a scalable approach which offers effective and efficient dynamic/smart energy pricing.

An important factor that might determine the pricing strategies of a firm is its business model. "A business model articulates the logic and provides data and other evidence that demonstrates how a business creates and delivers value to customers" [6, 2010, p. 173].[3] It includes the way in which the technology and human capital are combined, plus the pricing system to create value for consumers while ensuring an acceptable profit margin. Many scholars refer to a business model as a statement of how the firm makes profit [7] and/or how technological inputs are transformed into economic outputs [8,9]. Magretta [10] refers to business models as how physical, human and other resources are combined and transformed into value for customers and other parties, and how the value generating firms are rewarded by the parties that receive the value from it. Teece [6] argued that a good business model must be able to deliver value propositions that are appealing to (i.e. create value for) customers, cost effective and relatively less risky, and enables considerable value capture by the business that generates and delivers products and services.

Value proposition, value creation and value capture interact with one another and do not necessarily imply traditional marginal cost-based pricing is the optimal strategy. Value proposition is a firm's promise or commitment to deliver a good or service (value) – e.g., a promise to connect an area to energy network, or a promise to deploy smart meters to customers. Value creation refers to the development of the goods or services to be delivered, while value capture is about how the benefits of the value created are shared by the firm, customers, society, etc. This implies that a business model deals with the development of new products, so this is not all about pricing energy, but also power quality and distributed generation access, among other

[2] The other three elements of marketing mix (including product, promotion, and place) can only indirectly influence firms' revenue and profits by influencing product pricing through their effects on price elasticity.

[3] The literature on business models has grown significantly. However, a comprehensive review of this literature is beyond this study. Readers interested in this literature are advised to see Zott et al. [33] and Wikström et al. [14].