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The dynamic of competition in presence of switching costs. The case of British Gas (1997-2007)

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Summary : Theoretical models with switching costs have shown that, in a dynamic game, firms have incentives to adopt two-period strategies. Initially firms will 'invest' in markets at an early stage in their development to be able to then 'harvest' at a later stage when consumers are locked-in to the supplier they have previously patronized. This article illustrates, based on a case study: the supply of electricity in Great Britain, that this two-period strategy is not always crowned with success. Specifically, certain firms (in this case British Gas) may have difficulties sustaining customer loyalty in the second phase because customers benefit from a 'learning effect', which in turn lowers their switching costs. Taking these learning effects into account could enrich the range of situations analyzed in the existing economic literature with respect to the understanding of the impact of switching costs on competition.

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1. Introduction

Imperfect competition can take different forms : be it through the exercise of monopoly, oligopoly or monopsony market power, the production of non-homogeneous goods, or price discrimination (Tirole J., 1998). Most of the models that deal with the issue of competition in the presence of switching costs are usually found amongst those that deal with the more general framework of markets with differentiated goods. This differentiation can be created through different ways: localisation, availability, quality, or lack of information concerning the existence of other goods and their characteristics. Differentiation allows for the possibility of price discrimination if arbitrage opportunities are limited. This is the case when it is difficult to sell-on the good to a third party once it has been purchased, either because the characteristics of the good in question do not allow it or because the good in question is bespoke to the preferences of one and only one precise category of consumers.

There are situations in which the act of purchasing a good can give rise to certain specific costs that fall solely on the purchaser. These costs, qualified as switching costs, can lead to product differentiation by implicitly modifying the characteristics of the good that has been exchanged. From the perspective of the consumer that purchases the good, the fact that switching costs may not be fully known until the purchase has taken place, leads to the differentiation of goods that would normally be a priori substitutes. This differentiation can lead the seller of the good in question to execute strategies which –if successful- will in turn differentiate the seller from his/hers competitors. These strategies are deployed in ways that are different according to the case : increasing switching costs to exploit consumer inertia and thus extract the maximum amount of consumer surplus, or alternatively reducing switching costs in order to favour switching and attract additional demand (Diamond P., 1971; Salop S., 1977; Klemperer P., 1987a).

Dynamically, the existence of switching costs can create incentives for firms to adopt two-period strategies. After making efforts in terms of price and advertising expenses to enter a new market and attract new clients (willingness to sacrifice, at least temporarily, their profitability), firms will modify their behaviour in a manner favourable to them (ending discounts, raising prices) counting on the existence of switching costs – which are borne by consumers - to act as a barrier to exit (Klemperer P., 1995). Thus, firms consent to make ‘sacrifices’ in the first period only because they anticipate being able to recoup their ‘investment’ in the second period.

This theory of dynamic competition in the presence of switching costs can be applied to several generic situations. Industrial sectors as varied as telecoms, the Internet, insurance or banking tend to support and corroborate its validity (OFT, 2003; Farrrell J., Klemperer P. 2007). The present article seeks to make a contribution to this body of empirical work[1].

[1] This article falls within the literary methods used in economic analysis (see D. McCloskey, 1998). We try to produce a narrative that plays the role of a “plausibility test” of these theoretical models of dynamic competition with switching costs. In this way we confront the conclusions of these models with a real life example, that serves to identify in an exploratory manner the anomalies or the surprises that may exist - in relation to the existing literature - and thus to advance new hypotheses that could, if rejected, be used to enrich future theoretical work.

We examine a market with switching costs : in this case the British residential electricity supply market. We analyze the strategies of the main firms that compete with each other in this market, and in particular we take a look at the strategy executed by British Gas (Centrica) the market leader during the 1997-2007 period. Two issues come to the forefront from this analysis. British Gas, having first taken the lead amongst its competitors, executed a two-period strategy, acquiring market share by means of door-to-door selling, strong advertisement and targeted prices. Nevertheless, contrary to its expectations, the company did not succeed in developing strong customer loyalty, which leads to the company failing to meet its profitability targets and the subsequent weakening of its business model.

Switching costs constitute a strategic variable for firms within this market, yet it is clear that the second phase of this strategy (harvesting) can be difficult to execute, at least this seems to have been the case for British Gas. It is harder than initially thought to develop customer loyalty, because customers reinforce their mobility when they learn how to switch suppliers. At the same time firms have limited means to erect barriers to exit ('exit' in this context refers to customers). This consumer learning effect which allows them to exercise their freedom of choice more easily - because their switching costs diminish over time- is almost absent from the theoretical models dedicated to analyzing dynamic competition in the presence of switching costs. Thus taking into account this effect could enrich the range of situations analyzed by the literature and their impact on the functioning of markets where there is imperfect competition.

This article is organized as follows. The first section contains a brief review of the literature dealing with the principal models that analyze dynamic competition when there are switching costs. The second part analyzes the case of the British electricity supply market over the period 1997-2007, insisting on the two-stages of competition. Following we present the main lessons drawn from this example. The third section concludes the article.

2. A brief literature review

Switching costs can be defined as the costs (real or perceived) that follow as a result of changing supplier, costs that would not have been borne by the consumer if he/she had remained loyal to his/her previous supplier. This means that a consumer that has bought a good from a firm may incur additional costs if he/she buys the same good from a different firm, even if the good in question is sold for exactly the same price. In other words, switching costs may arise in any commercial relationship when the parties involved have gains to make from renewing their relationship instead of starting a new one with a different supplier (OFT, 2003, Klemperer P, 1987a).

This gives a characteristic of specificity to the commercial relationship once it has been established. Thus, from a consumer's point of view switching costs introduce a differentiation of goods that are a priori identical as far as their technical, usage and price characteristics are concerned. This differentiation can have numerous consequences, including the price level paid by consumers, the structuring of the market and the strategic behaviour of firms.

Switching costs may be classified as follows (Klemperer P., 1987a):

- Information costs: these are related to research and information gathering activities conducted by consumers prior to the purchase of the good in question in order to identify the available offers and to compare them with each other so as to find the one that best corresponds to his/her needs.
- Transaction costs: they arise most notably from the opening and closing of a contractual relationship with a supplier (closing an account, communication of new account details, etc).
- Learning costs: they relate to the consumer learning how to use or manage a new product or service. Even in the case of products that are functionally identical the consumer may have to discover and learn how to use the functionalities of the new product (i.e. software associated to the acquisition of a new computer).
- Uncertainty: these costs relate to the uncertainty surrounding the consumption of the good, i.e. when the good in question sold is an experience. In this case, the consumer is confronted with a degree of uncertainty with respect to the real quality of the service that is being sold by the new supplier.

Numerous articles have tried to examine the impact of the presence of switching costs on the functioning of markets[1]. In the next section we present an overview of certain key conclusions that have come out of these works in question.

Models without price discrimination. In these types of models, the underlying hypotheses are that all consumers face an identical price in each period; two firms (A and B) are in competition and they bear their own production costs. The existence of switching costs introduces a differentiation element amongst consumers, notably, those consumers already tied to a supplier (C1) and those that are not yet tied to a supplier (C2) (Klemperer P., 1995). C1 type consumers must bear an additional cost to change suppliers. Firm A, wishing to attract customers of Firm B, must reduce its price below Firm B's so as to compensate for the switching costs borne by consumers. As price discrimination has not yet been introduced in this model, Firm A must charge the same (lower) price to its existing customers. Firm A will thus have to proceed to make an arbitrage decision between the gains to be made from acquiring new customers and the foregone profits that will result from charging a lower price to its entire customer base. The choice will be a function of Firm A's historical market share: the larger it is the smaller the net gain to be derived from a strategy that targets the acquisition of new customers.

Let us now consider not just one period, but instead two. During the first period, the two firms compete with each other to attract consumers, in the second period; consumers will bear the additional costs if they wish to change suppliers (in this model, there are no new consumers). This type of setting can illustrate a market that is evolving from an expansion phase (with intense competition seeking to attract the maximum number of clients) to a mature phase where consumers are tied to a supplier. Farrel J. et Shapiro C. (1988) show that, in the second period, the firm that benefits from the largest market share will be able to charge a price higher than that

[1] This part follows largely from the literature review conducted by the OFT (2003). Equally, Farrell J. et Klemperer P., 2007.

of the rival firm without having to fear a loss of market share - to the extent that the firm in question benefits from a large base of captive customers not inclined to change suppliers-. Thus the firm in question has more to gain from increasing its prices and extracting additional profits from its own client base than in acquiring market share. This incentivises both firms to compete aggressively in the first period so as to gain the largest possible market share, even if this means charging prices below marginal cost[1]. These types of two period strategies are known under the terms "bargain then rip-off" or "investing then harvesting" (Klemperer P., 1987a, b ; Klemperer P., 1995 ; Padilla A., 1992 ; Farrell J. et Klemperer P., 2007).

The existence of new consumers in the second period, introduces the need for competing firms to make an arbitrage decision between, charging higher prices to their own clients or investing to gain new clients. This arbitrage will also be influenced by each firms' market share. The firm with the smaller market share will have a bigger incentive to offer lower prices. This can be interpreted in the following way: the existence of new consumers can partially protect captive consumers by modifying the price strategies of at least some of the firms competing in the market.

The overall impact of these new clients on the strategies followed by firms during the first period can nevertheless be ambiguous (OFT, 2003). Particularly when one considers that, when there are new consumers in the second period, firms will have less of an incentive to compete aggressively against each other in the first period if this implies that there will be an important disequilibria in the second period, with one firm having a large market share and another one a smaller market share. In this instance the latter will have an incentive to reduce its prices to attract new consumers, which would force the larger firm to in turn reduce its prices (both prices being influenced by switching costs, which we have assumed to be fixed). One could thus expect that in a market where there is a significant amount of new consumers in the second period, firms will not compete aggressively in the first period. In this way, firms signal to each other that they are ready to be aggressive with respect to their pricing policies in the second period. They are thus prone to modify their strategy from – in the words of D. Fudenberg and J. Tirole (1984) - one of "fat cat' to one of "lean and hungry"

Models with price discrimination. Introducing the possibility of firms discriminating amongst their respective client bases leads to the following results. Chen (1997) presents us with a model in which firms can discriminate between their old clients (captive) and their new clients by charging different prices to each group. New clients pay a lower price than the older (captive) clients for the same good, which allows the firm to attract these new clients –as they are compensated for their switching costs-. The model is based on two periods and assumes that two firms produce an identical good. In the first period, the firms compete with each other on price, and in the second period they may offer discounts. Consumers face additional costs if they switch suppliers. Both firms are assumed to have perfect knowledge of the purchasing practices of consumers in the first period.

In this model, firms adopt a strategy of 'investing' in the first period and then 'harvesting' in the second period. Moreover, the price strategies developed by each firm are independent of their respective market share. The firm with the higher

[1] Overall even when consider the 'investing' period, most models are in agreement in concluding that prices in a market with switching costs will be higher that those that would prevail in the absence of switching costs.

number of clients will not necessarily offer a higher price to its clients than the firm with the smaller market share. This is due to the fact that the possibility of discriminating in the presence of perfect information increases the price elasticity of demand. During the second period, if the larger firm were to sharply increase the price it charges its captive clients, the smaller firm could seek to attract them by proceeding to offer targeted discounts. These discounts will be all the more interesting the higher the price differential between the two firms becomes.

In fact, the dominant firm must moderate its price rises, even for its captive customers. The profits derived by firms in competition are lower, and the market shares of the two competing firms are not stable (loss of market share of the dominant firm in favour of its competitor). It must be noted that this model makes a strong hypotheses, which is that firms have perfect knowledge of customers' practices, this allows them to execute strategies conducive to efficient discrimination (for other models based on price discrimination see also, Nilssen P., 1992; Shaffer G. & Zhang Z., 2000 et Taylor C., 2003).

Models with endogenous switching costs. In the previous models described, switching costs were considered to be exogenous. In other words, switching costs were deemed to be independent of strategic actions taken by firms. We now turn our attention to consider switching costs as strategic variables: thus making them endogenous. Firms can have incentives to make switching costs rise in order to increase the difficulties borne by consumers when changing suppliers (thus erecting barriers to exit). In order to do that, firms are prone to seek to manipulate compatibility costs (by making their products less compatible with each other and their usage more specific) and transaction costs (by creating loyalty programmes). The possibility to make switching costs endogenous has been taken into account by certain models (P. Klemperer, 1995), in which firms decide in period 0 whether to increase or not switching costs, after considering the impact on their expected profits in periods 1 and 2. There has not been much research done on the issue of what measures consumers may engage in to mitigate or bypass the actions taken by firms in order to artificially raise switching costs. M. Riordan's and D. Sappington's (1989) article, suggests that a possible strategy that could be undertaken by consumers in order not to be too captive would be to diversify their purchases by seeking to source themselves from a second supplier selling the same goods.

The workings of markets with switching costs. Modeling the impact of switching costs on the way that markets work can lead to numerous interesting theoretical conclusions. We consider the following to be the most significant:

- The introduction of switching costs in the analysis of strategies executed by firms shows that the "investing/harvesting" strategy can be a dominant strategy for firms. It leads firms to compete (via prices) in the first period - even if it means pricing below marginal costs- in the expectation that they will reap the benefits in the second period by increasing prices charged on their captive client base.

- Firms' decisions will depend on their capacity to offer price discounts to certain –well identified- category of consumers (price discrimination with perfect information) and/or to artificially increase customers' switching costs. The nature of the market in question (mature with little or no new consumers entering the market or fast growing) will also affect the strategic behaviour of firms.

- These decisions will have an impact on market structure: the market share of the incumbent firms (their size and stability), churn rates, ease or difficulty of entering the market. We would like to highlight that the existence of switching costs does not necessarily imply higher barriers to entry into the market. The incumbent firm (benefiting from a captive client base), will not necessarily react in an aggressive way to a perceived threat of entry, specially if the latter is concentrated on a particular segment of the market i.e. on new customers in an growing market (Farrell J. et Klemperer P., 2007; Gabszewicz J. et al., 1992).

3. The British electricity supply market

The European electricity sector has been progressively liberalised to the point of allowing for competition in the residential supply segment of the value chain, which became mandatory in all EU member states on July 1st 2007. Ahead of other member states Great Britain began opening its residential electricity supply sector in September 1998[1]. In this section, we will examine how the competitive dynamics evolved in the British market during the period 1997-2007, thereafter we will contrast the conclusions arrived to from this analysis with the results derived from the theoretical models described in the previous section.

3.1. Description of the market

The residential electricity supply market is characterised by four elements that can have an impact on the dynamics of competition: a) the opening of the market and the opportunity to switch suppliers, brings to the forth the issue of switching costs that firms will now have to consider in their strategies aimed at either acquiring new clients or creating client loyalty; b) the product: 'electricity supply' is a homogeneous product in terms of its quality, it is thus difficult for suppliers to propose a differentiated good beyond that of price differentiation; c) the market is mature (weak growth in demand) and almost all customers are already tied-into a pre-existing supplier[2], which rises new client acquisition costs for new entrants; d) it's a subscription market with the peculiarity that a consumer cannot seek to be supplied by two firms at the same time.

These characteristics create a set of constraints for firms in competition, which will have to consider these issues in their actions (choice to enter the market, pricing policy, level of discounts granted to certain categories of consumers). To these constraints, there are, in addition, specificities unique to the British market, which are a result of the industrial structure existing prior to the opening of the retail electricity supply market.

1 It was completely opened in May 1999.

2 Between 2003 and 2007, almost one million new clients were added to the total client base in the British market thus bringing the total account number to 26,7 million at the end of 2007. This modest growth in account numbers (less than 4% over a five year period) was driven by clients that were already being serviced by a supplier but that opened a second account (due to the establishment of a secondary residence, separation, divorces, etc). New customers entering the market (arriving on British territory) were relatively few.

Before the reforms initiated by The Electricity Act 1989, the British electricity sector was organised in the following manner: one state owned company was in charge of the generation and transmission of electricity (the Central Electricity Generating Board or CEGB), distribution and supply was guaranteed by 14 regional monopolies, also state owned, better known by their acronym, the RECs: Regional Electricity Companies (Helm D., 2004). These regional distribution-supply monopolies benefited initially from a franchise granting them exclusivity to supply residential customers in their respective historical zones. The first phase of the reform was to privatise them between 1990 and 1991, and then to gradually make their geographical supply monopolies disappear (Surrey J., 1996)[1].

3.2. A generalised investing phase (1997-2003)

As mentioned before the pre-existing industrial configuration of the retail market was characterised by the existence of the historical regional distribution/supply monopolies. Thus initially the competitive dynamics in the retail electricity supply segment were characterised first by an extension of the geographical footprint of several suppliers and thereafter by the creation of a unified market, epitomised by the establishment of national brands. For all the incumbent firms (and a fortiori for all those seeking to enter the incumbent firms' markets), the acquisition of clients outside of their historical (former monopoly) zone became a necessity.

Two elements characterise this first phase of competition. On a first instance, the former distribution monopolies enter the zones of their homologues and begin to take market share from them. By December 2003, the portfolio of the former monopolies is composed as follows: 75% of their clients are still former clients from their historical operation zones and 25% are clients located outside of their historical influence zone (Electricity Association, 2004; OFGEM, 2004) [2]. This loss of market share impacts all of the existing firms in all of their zones (nevertheless there are significant regional variations), indicating that competition is thus developing over the whole geographical market (see Table 1 on the following page).

The second element, is the appearance of a new entrant in the electricity supply market, British Gas, the former public gas supply monopoly, gathers over the course of a couple of years a client base of several million electricity supply clients, to the point of having a 24% market share by the end of 2003[3].

[1] The CEGB was also split into production and transmission activities. The production activities were distributed amongst several companies that were themselves privatised in 1991 and 1996.

2 Note that between the privatisation dates and 2003, the 14 former distribution-supply monopolies proceeded to vertically integrate upstream (M&A with generation companies – excluding nuclear- and by developing new production units) thereafter they merged amongst themselves creating 5 integrated groups (Npower, SSE, EDF Energy, Powergen, Scottish Power). Foreign large European energy groups control four of these five groups.

3 British Gas is the supply brand used by Centrica. Centrica was created in 1997 following the privatisation and dismantlement of the former public monopoly British Gas. Centrica regrouped the retail supply activities in the UK (thereby retaining the brand) and some upstream gas assets that belonged to the former British Gas monopoly. The retail gas supply market was partially opened to competition in 1996 and then completely in 1998 (before the complete opening of the electricity supply market).

British Gas becomes the main challenger of the former regional monopolies over all their zones by offering electricity to all its former historical gas customers. On the other hand, the other new entrants do not succeed in establishing a durable presence in the market, and are either bough or cease operations after a couple of years (Littlechild S., 2005). At the opening of the market there were 14 new entrants in the electricity supply market, today there are only four. Together they account for less than 0.3% of total electricity retail sales (OFGEM, 2008).

Five years following the opening of the market to competition around 44% of residential customers had changed suppliers, a situation not encountered in any other European country (Defeuilley C., 2009). British Gas accounted for 60% of this total, the rest being distributed amongst the five large groups that were created out of the M&A activity that occurred around the former distribution-supply monopolies. The market share of other players was insignificant.

Table 1. Entry of historical suppliers into areas outside of their historical zones (2003)

Supplier	Residential clients total		Within historical area customers		Out-of-area customers	
	%	Number	%	Number	%	Number
Npower	15%	3 751 800	76,52%	2 870 750	23,48%	881 050
SSE	14%	3 501 680	81,93%	2 869 060	18,07%	632 620
EDF Energy	14%	3 501 680	88,96%	3 115 260	11,04%	386 420
Powergen	21%	5 252 520	77,90%	4 091 760	22,10%	1 160 760
Scottish Power	11%	2 751 320	66,90%	1 840 620	33,10%	910 700
Total	75%	18 759 000	79%	14 787 450	21%	3 976 550
British Gas	24%	6 002 880	0,00%	0	100,00%	6 002880
Others	1%	250 120	0,00%	0	100,00%	250 120
Total	**100%**	**25 012 000**	**56%**	**14 787 450**	**44%**	**10 224 550**

Sources: calculated using Electricity Association, 2004; OFGEM, 2004. Figures as of end of 2003.

Firms clearly implement an expansion strategy, characterised by the will to increase their market share and enlarge their client base (Mollard M., 2007). For this strategy to be successful, they are obliged to bear part of the switching costs that act as barriers to entry and slow down the switching rates of consumers. This kind of strategy is characterised by an 'investing' phase during which the competing firms will temporarily sacrifice part of their profits in order to gain new clients. The differentiation of the product 'supply of electricity' being limited (the good is a homogeneous one, its quality is defined by strict technical standards), firms will choose to differentiate their products through their pricing policies (and to a lesser extent by the types of contracts offered) and by their advertisement and marketing efforts.

Pricing policies. The former monopolies begin to adapt their strategies and they begin to discriminate amongst their client base by charging higher prices to their 'historical clients' (those clients located within their historical former monopoly distribution-supply zone) and lower prices to those clients situated outside their

historical territory. Firms proceed to implement pricing policies -not at the national level- but on a region-by-region basis (the 14 former distribution-supply monopoly regions), they thus geographically segment the market (place of residence of the client)[1]. They can thus target with certainty to which type of client their different types of offers are addressed. This strategy is implemented by all the former monopoly suppliers, and results in a significant price differential (above 10% on average) between the prices charged by the historical operators within their historical zones and the best alternative offer for the same zone (OFGEM, 2007).

Within their historical zones, the former monopolies fix their prices in reference to those charged by British Gas. British Gas being considered the most serious of the challengers by the former monopolies, that is to say, the one that could make them loose the largest number of clients. Two reasons lead to this conclusion. First, British Gas is the only firm with a national brand recognised by almost all electricity consumers. Over 80% of British households are connected to the natural gas distribution network (OFGEM, 2008). Second, British Gas suffered an unfavourable market opening of its historical market (gas supply) and an asymmetric regulatory regime that forced it to loose market share in its retail gas supply business from 1996 onwards, a fact that favoured electricity suppliers[2]. British Gas must therefore seek to reconstitute quickly its client base or alternatively risk being marginalised (Thomas S., 2003).

British Gas decides to respond to the entry of the electricity suppliers into the gas supply market by entering into the electricity supply market. British Gas leverages strongly the two assets that are conferred to it by its nationally recognised brand and its historical relation with consumers (its residential gas supply market share was 76% in 1999 versus 100% in 1996). The firm begins to propose a combined offer: electricity and gas (dual fuel), which in essence simply means offering to sell electricity to its own gas residential customers. The prices proposed by British Gas become frequently slightly lower than those of the former monopolies. The firm appears thus –in the eyes of consumers- as the least expensive 'known alternative supplier'. Outside of their historical zones, the former monopolies begin to offer prices generally below those of the historical supplier and equally lower than those proposed by British Gas, who can, as we have seen, count on its notoriety[3].

One could thus consider British Gas as being the pivotal firm in the market, in reference to which the other firms determine or adjust their price offers (OFGEM, 2008, House of Commons, 2008). This does not necessarily mean that they do so also in terms of timing. British Gas is not generally the first firm to publicly announce its price changes. The former monopolies have a certain degree of flexibility to pre-

1 At least during the years immediately following the opening of the market. Later on as historical switching increases in the system, accounting for flows derived from moving, the historical relation between consumers and their suppliers becomes more difficult to manage.

2 In the gas market, the regulator forces British Gas to loose market share in the Industrial and Commercial segment of the market, which is rapidly penetrated by Oil & Gas firms. The firms must thus concentrate on supplying the residential market, which was being attacked by the electricity supply firms. Later on, the regulator also prohibits Centrica from lowering its prices in the residential gas supply sector until it judges that there is a sufficient degree of competition. This will eventually be the case in 2002.

3 Note that the British regulator, OFGEM, decided to regulate until 2002 the offers made by the former monopolies to their historical clients. Constraints on their minimum prices are set (minimum price restraints), which allow competitors to offer more competitive prices and gain market share –within the context of a market where wholesale prices were falling- (Mollard M., 2007). These price controls are abolished in 2002.

empt British Gas without too much risk (if they consider that it is in their interest to do for image reasons or for profitability reasons). In effect, they can anticipate what could be British Gas' future price movements by virtue of public information at their disposal[1].

Advertising and direct marketing. The second differentiating factor used by firms is advertisement and door-to-door sales. The former monopolies and the new entrants engage themselves in aggressive client acquisition campaigns. This results in increased advertisement expenditures[2] and into massive direct marketing campaigns (specifically into door-to-door sales campaigns) [3]. In June 2003, over 90% of the market is targeted through this latter method, with annual advertisement expenditures estimated to be in the region of £250 million (OFGEM, 2008). Advertising and direct marketing allow the supply firms to free themselves from having to compete on price to attract new customers, some even resort to the use of questionable practices (House of Commons, 2008).

Initial investments and profitability. The necessary investments required in order to acquire a client base (in terms of publicity, of direct marketing and of competitive price offers) are executed to the detriment of profitability. British Gas is an example of this practice. The firm decides to embark on a massive acquisition strategy and invests several hundred million pounds in advertisement, direct marketing, and the deployment and implementation of its IT client relationship management and billing systems. This results in significant initial investments that have a negative impact on gross margins during the first four years (1997-2000).

British Gas accumulates almost £400 million in operational losses during this period. Although British Gas manages to rebalance the situation in the subsequent 3-year period (2001-2003), the result is modest (around £150 million of cumulative operational profit), which represents a gross margin below 4%. Overall, during the period comprised between 1997 and 2003, British Gas does not succeed in kick-starting a positive operational profit on its retail electricity supply activities (see following table).

This initial period, characterised by a strong investment phase, leading to recurring operational losses, had been anticipated by the firm, which had given itself up until 2000 to begin making progress in terms of producing positive results (Centrica 2001). British Gas barely manages to stick to this timetable; all in all it takes an additional year (compared to its original plans) to produce its first operating profit in this business segment (residential electricity supply).

[1] British Gas gives every year provides abundant information in terms of its electricity and gas sales activities: number of clients, turnover, consumption, sourcing costs, distribution costs, operational costs gross margin, profit targets. From the information provided, it is possible to estimate with a reasonable margin of error what is the financial equation that British gas needs to solve and how it may change its retail price levels in function of changes to wholesale prices.

2 More than £150 million are thus spent on advertisement campaigns between 2001 and 2004 (Electricity Association, 2003; 2004 ; 2005).

3 According to different estimates the costs of acquiring an electricity supply client are somewhere between £30-60 (Waddams-Price C., 2004 ; Littlechild S., 2005), to which one must add the operational costs, which are estimated to be £20- 30 per client.

Table 2. British Gas retail electricity sales figures in GB (1997-2003)

	1997	1998	1999	2000	2001	2002	2003
Client numbers (000)	0	850	2100	4000	5400	5795	6189
Market share (%)	0%	3%	8%	15%	20%	22%	24%
Turnover	0	5	240	792	1242	1380	1547
Distribution and wholesale costs	0	5	156	686	972	1 037	1 165
Operational costs	25	85	84	106	270	289	328
Operational profit	-25	-85	-156	-107	40	54	54
Gross margin	n.s.	n.s.	-65%	-13,5%	3,2%	3,9%	3,5%

In £million. For 2001, 2002 and 2003, data regarding operating costs, operational profit and gross margin are estimates (Morgan Stanley's). Sources: Centrica, *annual reports*, Morgan Stanley, 2007.

What about the other firms operating in the market ? Due to a lack of specific business segment data, it is difficult to determine with the same precision the investments that they have realized and the results that they subsequently had during this period[1]. We can nevertheless guess that the expenses incurred by British Gas in terms of advertisement and direct marketing should have incited them do likewise in order to limit or compensate their resulting client loses. The pricing policies of British Gas, likewise, had an impact on the pricing policies of its main competitors. The latter begin to use British Gas prices' as *de facto* '*price ceilings*' not to be surpassed in the zones where they operate (excluding their historical operating zones).

Beyond that level, the offers of British Gas' competitors are fixed at levels that are influenced by geographical targets regarding market extension that its competitors have chosen, by their profitability goals and by their sourcing costs. British Gas' competitors rely to a large extent on self-supply given their portfolio of physical assets. In any case, the '*investing*' strategy undertaken by British Gas ends up having repercussions on the decisions taken by the former electricity distribution-supply monopolies. However, the latter were able to benefit from factors that softened the impact of British Gas' strategy (captive clients in their historical operating zones and partial or total physical coverage of their downstream retail requirements). These factors helped to limit the financial impact of British Gas' "*investing*" strategy phase on the historical operators.

The firms competing in the British market try thus to attract clients that have become less mobile due to existence of switching costs by clipping their margins. The Main new entrant, British Gas, plays a central role, in this 'investment' strategy, which we have chosen to analyze during the period 1997-2003 for the following reasons: 2003 marks the high watermark in terms of clients targeted by door-to-door salesmen and the highpoint for British Gas in terms of new client gains. In 2004 a new approach begins, characterised by important changes in terms of price offers, which could be considered as attempts to execute a 'harvesting' strategy.

[1] The other firms are vertically integrated and do not provide as much detailed accounting information regarding their retail sales as British Gas does in the United Kingdom.

3.3 British Gas : an aborted harvesting attempt

Beginning in 2004 and up to 2006, British Gas will try to secure a return from its initial investments. The group modifies its pricing policy for its residential customers. In 2004, British Gas announces a price increase above and beyond that of all its other competitors. The group passes on, in a more aggressive manner, the rise in wholesale prices to its final customers. The rise in wholesale prices having forced a rise in British Gas' sourcing costs. In 2005, British Gas is one of the last companies to announce a rise in prices, but when it does so, it is one of the highest. Finally in 2006, once again it is one of the suppliers that increases the most its retail prices. Overall taking into account the date of the announcement and the level of price rises, British Gas is the supplier that increased the most its prices between 2004 and 2006 (House of Commons, 2008).

Table 3. Timing of announcement and price rises (2004-2006)

2004	Price rise	Date
EDF Energy	3.8%	13th September
British Gas	9.4%	20th September
Npower	7.6%	1st October
Scottish Power	8%	4th October
Powergen et SSE	0%	
2005	**Price rise**	**Date**
EDF Energy	5.4%	17th January
SSE	6.7%	1st March
EDF Energy	12%	5th August
Powergen	11.9%	31st August
British Gas	14.2%	19th September
Scottish Power	12%	17th October
Npower	0%	
2006	**Price rise**	**Date**
Npower	12%	1st January
SSE	8.9%	1st January
Scottish Power	8%	1st March
British Gas	22%	1st March
Powergen	18.4%	10th March
EDF Energy	4.7%	13th March
Npower	13.4%	31st March
SSE	9.4%	1st May
Scottish Power	10%	1st July
EDF Energy	8%	31st July
Powergen	9.7%	21st August
British Gas	9.4%	1st September
Npower	9.9%	1st October

Source : Energywatch in House of Commons, 2008.

A failed gamble. British Gas takes the gamble that it will be able to increase its prices faster than its competitors in order to re-establish its operational margins, without at the same time, loosing an important number of clients. British Gas being well established within the electricity supply segment, with a strong notoriety and selling both gas and electricity; the firm considers that it has the necessary trump cards to retain its clients and to render them less susceptible to switch in the face of the price gaps that begin to emerge between British Gas and its main competitors.

Yet the result is precisely the opposite. British Gas begins to loose market share rapidly starting in 2004 and running up to 2006. Overall the net balance of customer gains and losses during this 3-year period is negative, resulting in a net loss of 430,000 customers, that is to say 7% of its end of 2003 client base. To compensate for these losses British Gas decides to intensify its advertising campaigns and its direct marketing efforts. This raises British Gas operational costs (acquisition costs and the costs of managing new customer accounts). This in turn ends up weighing heavily on margins, which do not manage to recover in spite of the rise in prices (see table 4). Finally, the trend is reversed and in 2007 the group decides to offer price reductions of greater magnitude than those of its main competitors in a context of falling wholesale prices[1].

Table 4. British Gas retail electricity sales figures in GB (2004-2007)

	2004	2005	2006	2007
Client numbers (000)	5 950	5 920	5 759	6 019
Market share (%)	23%	23%	21%	22%
Turnover	1731	1836	2 280	2 161
Sourcing and distribution costs (energy)	1 385	1 474	1 825	1 700
Operating costs	346	340	378	350
Operating Profits	68	22	77	111
Gross margin	3,9%	1,2%	3,4%	5,1%

Figures in £ millions. The data regarding operating costs, operational profit and gross margin are estimates (Morgan Stanley's). Sources: Centrica, A*nnual reports*, Morgan Stanley, 2007.

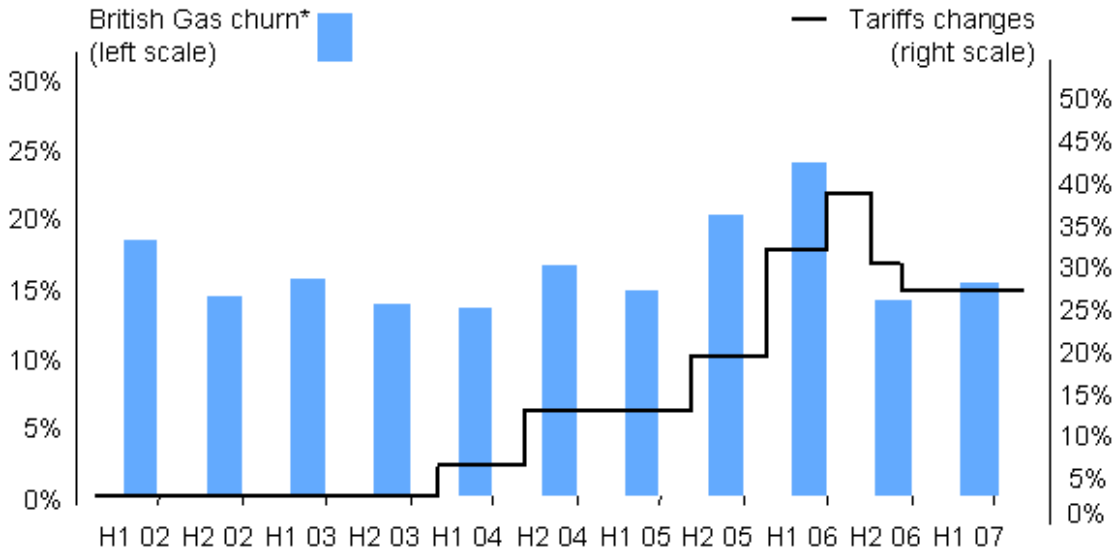
In the end British Gas does not manage to meet its operating margin targets: the company's residential electricity supply financial results remain weak and below its long-term objectives (operating margin within a 5-10% range). Since 1997, the leader of the British market only manages to make a cumulative operating profit of slightly over £50 million, eventually it takes the firm 7 years (2001-2007) to cover its initial losses from entering the electricity supply market (1997-2000).

How to explain this phenomenon? The customers attracted by British Gas were by definition mobile (switchers): having switched suppliers at least once when quitting their historical electricity supplier. These clients are generally well informed regarding prices, offers and the gaps that may arise between the prices of different competing suppliers. They react accordingly exercising their freedom of choice. British Gas' clients switching rates remain high, and tends to increase during periods of price rises, when the price differential –perceived or real- between the prices

[1] In 2007, the group succeeds in increasing its gross margins by choosing strategically the timing of its announcements related to price changes. The group benefits from a fall in wholesale prices –beginning of 2007- which it will not pass-on to its clients until the March. The group manages to gather profits and then significantly lowers its prices (more so than its competitors) which helps it to gain clients. This kind of situation is difficult to replicate following a period of price rises. Customers seem more inclined to change supplier following a price rise rather than following a price fall (they anticipate a reaction from their existing supplier and prefer to wait rather than switch). Aside from this during the 1st semester of 2008, characterised by a new episode of price rises, British Gas' operational margins on its retail sales return to more modest levels (around 3%).

offered by the firm and those of its competitors increases (see next figure). The behaviour of British Gas' clients did not change as desired by the firm: they did not become less mobile as time went by or more loyal.

Figure 1. Sensitivity of British Gas' clients to tariff changes (2002-07)



* Cumulative number of losses and gains within British Gas' client base related to the group's total.
Sources : Centrica, A*nnual reports*, Morgan Stanley, 2007.

This forces British Gas to have to align closely its tariff to changes in wholesale electricity prices and at the same time to continuously spend money on advertising and publicity campaigns in order to attract new customers in order to compensate for its customer losses. This makes the firm's costs structure increase and reduces its opportunities to bring down its charges in order to improve its operating margins. The company is nonetheless able to use certain tools at its disposal in order to try to improve this situation: by trying to reduce operational costs tied to client relationship management (outsourcing, reducing payroll, better management of IT systems and billing systems, etc.), the timing of announcements related to tariff changes, the introduction of capped price offers over a several year time horizon, etc. Measures that in essence seek to reduce churn rates amongst clients by offering them protection against a possible continuation in the rise of wholesale energy prices. (OFGEM, 2008).

On the other hand, British Gas's competitors are in a better position. They have at their disposal a historical client base, these 'historical' clients are generally less prone to switch and equally less sensitive to price changes. Furthermore, the competing firms, own more physical electricity production assets (generation capacity) that in turn render them less dependant on wholesale markets. They thus have larger room for manoeuvre when choosing their pricing policy, equally they more flexibility when trying to sustain or re-establish their operating margins.

Learning effects and endogenous switching costs. The difficulties encountered by British Gas in moving from an 'investing' phase into a 'harvesting' phase can be mostly explained by the behaviour of its client base. Switching costs are neither constant nor static. Once suppliers enter into the competitive game, their actions have an effect both on the level and the nature of certain components of switching

costs. On the one hand, advertisement expenditures and direct marketing campaigns considerably and permanently reduce consumers' information and research costs. Consumers who have changed suppliers, at least once, maybe benefiting from learning effects. Their past experiences contribute to improving their knowledge and their information as well as their capacity to make an effective choice that corresponds to their preferences. This learning dynamic allows consumers to gain expertise and autonomy *vis-à-vis* suppliers. This ends up contributing to reduce the level of switching costs that consumers face and in turn favours their mobility[1].

New entrants are the most affected by this issue. They effectively attract those consumers that are the least risk averse and that have the lowest switching costs, and who consequently constitute the group that is the most sensitive to price changes. Clients that leave their historical supplier, reveal –through their behaviour- their propensity to be mobile and their risk taking profile. *A priori* they are the types of clients that will be the most difficulty to retain and the most likely to set in motion learning dynamics.

This places new entrants in a more difficult situation compared to historical suppliers who dispose of a pre-existing client base. Additionally, suppliers have few tools with which to reinforce customer loyalty. Suppliers have not been able to effectively bundle the sale of high value added associated services to the sale of electricity. Doing so would have allowed them to (i) differentiate their offers in qualitative terms (ii) reduce the price elasticity of their customers. Whilst it maybe the case that retail competition may lead to the introduction of certain improvements (innovative contracts in terms of prices and tenure, dual fuel offers, energy efficiency advice, etc), it does not become automatically the source of radical innovation capable of enriching the content of the offers made by electricity suppliers. Suppliers have –so far- not been able to create strong customer loyalty via the proposal of new services or functionalities. What are the consequences of taking into account consumers 'learning effects' on the analysis of the functioning of the competitive dynamics in a market with switching costs?

- Switching costs are a strategic variable, not only for firms (who can raise them artificially in order to reduce mobility) but also for customers, who can reduce their level via dynamic learning effects. Consumers, or at least some consumers, are capable of making switching costs become an endogenous variable.

- This strategic variable (switching costs) will weigh more heavily on new entrants than on the incumbents. Incumbents benefit from having an existing client base whose behavioural characteristics are different. New entrants face two handicaps: they have additional costs to incur in order to acquire clients and these clients are harder to retain. If these constraints are known and observable they can have a negative effect not only on new entrants expectations (regarding the potential opportunities in entering a market) but also it can have an effect on the expectations of incumbent firms (regarding the opportunities to compete aggressively with each other if it will be actually difficult to retain customers in the second period).

1 Nevertheless, not all the elements that make up switching costs are concerned. Transactional cots cannot be modified permanently either by operators or by customers switching experiences given that these are costs associated with entering or re-entering into the contractual relationship: they are thus recurrent. (Nilssen T., 2000). Only intervention by the public regulator can modify their level or their allocation amongst the different players.

- The clients of existing (incumbent) firms are less mobile (less prone to switch) than those of new entrants, consumers have heterogeneous behaviour characteristics. This heterogeneity implies that new entrants have more difficulty in successfully price discriminating between those customers who make part of their existing client base and those customers that they wish to attract.

Imagine the case of Firm A, who is unable to price discriminate it must make an arbitrage decision between the gains to be made from acquiring new clients and the gains to be foregone due to the reductions in price that it will have to extend to its existing client base (due to it being unable to price discriminate). This arbitrage will be influenced by Firm A's market share: the bigger it is the lower the net gain from executing an aggressive acquisition strategy. This effect maybe reinforced by two factors: a) can Firm's A competitor price discriminate?, b) is the market 'mature' i.e. the number of clients not attached to an existing supplier is limited.

In such a situation Firm A, has no incentives to try to establish an important client base in the first period (and if Firm A is a new entrant it has no incentives to enter the market), this is because Firm A will be aware that in the second period it will not be able to price discriminate (and therefore it will not be able to recoup its investment efforts from the first period), whilst at the same time it is aware that its competitors are able to do so. In this way, one can arrive to a conclusion which is in essence opposed to that derived from the works of J. Farrell and C. Shapiro (1988).

Taking into consideration the learning effects of a segment of consumers creates a degree of heterogeneity in the choices faced by competing firms. Certain firms are able to price discriminate; others are not able to do so. This introduces a bias in favour of the incumbent firms and it tends to reduce the incentives that firms have to compete with each other to acquire a set of customers that in the end risks being (by its very nature) difficult to retain.

4. Conclusion

The analysis of the residential electricity supply market in the United Kingdom has allowed us to identify the important role played by consumers learning effects on the strategies executed by the firms competing in the market. Taking into account the heterogeneous nature of consumers' behaviour can enrich the conclusions derived from theoretical models that analyse competitive dynamics in the presence of switching costs. In this particular case study, it seems that the aborted attempt by British Gas to move into a 'harvesting' phase could have an important impact on the market equilibrium outcome. It may discourage new entry and additionally it may reduce suppliers incentives to compete with each other via prices.

References

Centrica (2001), *Annual report 2000*, London

Chen, Y. (1997), "Paying consumers to switch", *Journal of Economics and Management Strategy*, vol. 6

Diamond P. (1971), “A model of price adjustment”, *Journal of Economic Theory,* vol. 3

Defeuilley C. (2009), “Retail competition in electricity markets”, *Energy Policy*, vol. 36

Electricity Association, (2003), *Electricity Industry Review 7*

Electricity Association, (2004), *Electricity Industry Review 8*

Electricity Association, (2005), *Electricity Industry Review 9*

Farrell J., Shapiro C. (1988), “Dynamic competition with switching costs,” *Rand Journal of Economics,* vol. 19

Farrell J., Klemperer P. (2007), “Coordination and Lock-In: Competition with Switching Costs and Network Effects”, in M. Armstrong and R. Porter (eds.), *Handbook of Industrial Organization*, North-Holland

Fudenberg D., Tirole, J. (1984), “The Fat-cat effect, the puppy-dog ploy, and the lean and hungry look,” *American Economic Review,* vol. 74

Gabszewicz J., Pepall L., Thisse J.F. (1992), “Sequential Entry with Brand Loyalty Caused by Consumer Learning-by-Using”, *The Journal of Industrial Economics*, vol. 40

Helm D. (2004), *Energy, the State and the market. British energy policy since 1979*, Oxford University Press, Oxford

House of Commons (2008), *Energy prices, fuel poverty and OFGEM*, Business and Enterprise Committee, vol. 1 et 2

Klemperer P. (1987a), “Markets with consumer switching costs”, *The Quarterly Journal of Economics*, vol. 102

Klemperer P. (1987b), “The competitiveness of markets with switching costs”, *Rand Journal of Economics*, vol. 18

Klemperer P. (1995), “Competition when consumers have switching costs : an overview with application to industrial organization, macro economics and international trade”, *Review of Economic Studies*, vol. 62

Littlechild S. (2005), *Smaller suppliers in the UK domestic electricity market : experience, concerns and policy recommandations*, OGFEM report, London

McCloskey D. (1998), *The rhetoric of economics*, Madison, The Wisconsin Universiy Press

Mollard M., (2007), *Théorie des coûts de changement et analyse de la concurrence de détail dans l’électricité. Le cas britannique*. Thèse de doctorat, Université Paris-Sud 11

Morgan Stanley (2007), *Centrica Business Changing Significantly - Justifies a More Positive Stance*, Morgan Stanley Research Europe, London, june 26.

Nilssen T. (1992), “Two kinds of consumer switching costs”, *Rand Journal of Economics*, vol. 23

Nilssen T. (2000), “Consumer lock-in with asymmetric information”, *International Journal of Industrial Organization*, Vol. 18

OFGEM (2004), *Domestic Competitive Market Review : A Review Document*, OFGEM, London

OFGEM, (2007), *Domestic Retail Market Report*, OFGEM, London

OFGEM (2008), *Energy Supply Probe - Initial Findings Report*, OFGEM, London

OFT (2003), *Switching costs,* Economic Discussion Paper 5, NERA report, OFT, London

Padilla A. (1992), “Mixed pricing in oligopoly with consumer switching costs,” *International Journal* of *Industrial Organization,* vol. 10

Riordan M. and Sappington D. (1989), “Second sourcing,” *Rand Journal of Economics*, vol. 20

Salop S. (1977), “The noisy monopolist : imperfect information, price dispersion and price discrimination”, *Review of Economic Studies*, vol. 44

Shaffer G., Zhang Z. (2000), “Pay to switch or pay to stay: preference-based price discrimination in markets with switching costs,” *Journal of Economics and Management Strategy,* vol. 9

Surrey J. (ed.) (1996), *The British electricity experiment. Privatization : the record, the issues, the lessons*, Earthscan Publications, London

Taylor, C. (2003), “Supplier surfing: Competition and consumer behaviour in subscription markets”, *The RAND Journal of Economics*, vol. 34

Tirole J. (1988), *The theory of industrial organization*, MIT Press, Cambridge, Massachusetts

Thomas S. (2003), “Gas as a commodity. The UK gas market : from nationalism to the embrace of free market”, in Arentsen M, Kunneke R. (ed.), *National reforms in European gas*, Elsevier, Oxford

Waddams-Price C., (2004), “Spoilt for Choice? The Costs and Benefits of Opening UK Residential Energy Markets”, University of Berkeley – CSEM WP n°123