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Evens Salies. Product innovation when consumers have switching costs. 2011. hal-01069477

HAL Id: hal-01069477
https://sciencespo.hal.science/hal-01069477

Preprint submitted on 29 Sep 2014

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Document de travail

PRODUCT INNOVATION WHEN CONSUMERS HAVE SWITCHING COSTS

N° 2011-07

March 2011

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11 février 2011

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Abstract

Economists have long recognized that in free markets, incentives to innovate will be diluted unless some factors grant innovators with a temporary monopoly. Patenting is the most cited factor in the economic literature. This survey concentrates on another factor that confers innovators with first-mover advantage over their competitors, namely consumer switching costs, whereby a consumer makes an investment specific to her current seller, which must be duplicated for any new seller. In this survey, we list several components of switching costs that are relevant as regards to firm innovation behaviour. The aim of this classification is twofold. First, consumer switching cost theory has matured to the point that some classification of switching costs for both understanding innovative firm behaviour and building policy-oriented models is necessary. Second, the classification included in this paper addresses the confusion that has been existing so far regarding the distinction between 'good' or 'bad' switching costs, perceived or paid switching costs, and between switching and search costs. This paper then surveys the existing literature on the effect of switching costs on product innovation by firms and the way they compete for consumers. We also raise several important regulation and competition policy questions, using examples from the real world.

JEL Codes: B21, D4, D83, L13, L14, L52, L96.

Keywords: Consumer switching costs, Search costs, Product innovation, Competition policy, History of economic thought

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1. Introduction

A primary weapon of a capitalist society is the development of new products that firms race to introduce before a competitor comes out with a model that consumers will love much better (Baumol, 2006). Economists have long recognized however that in free markets, incentives to innovate will be diluted unless some factors grant innovators with a temporary monopoly (Tirole, 1988). Patenting is the most cited factor in the economic literature. This survey concentrates on another factor that confers innovators with first-mover advantage over their competitors, namely consumer switching costs, whereby " ... a consumer makes an investment specific to her current seller, that must be duplicated for any new seller" (Klemperer, 2008). This concept that has been formally introduced in theoretical economics in the seminal journal articles of Von Weizsäcker (1984) and Klemperer (1987),[1] can be dated back to Schumpeter (1942) who suggested a role of long-period contracts as devices for tying prospective customers to investing firms.

Unlike patenting or other price or non-price strategic instruments, temporary monopoly power can arise as a purely demand-side phenomenon when e.g. consumers want to avoid transaction costs (the cost of using the market in the sense of Coase, 1937) or learning how to use another firm's technology. The effect of consumer switching costs on innovation is controversial, however, and has been largely neglected in the economics of the firm literature, in which the focus on demand inertia is for the case of business-to-business relationships, where buyers are firms.[2] On the one hand, it is natural that consumers who have developed product usage skills on one innovative product will want these product-specific skills to be transferable across all functionally identical product classes. Thus, as asserted by Pae and Hyun (2006, p. 22), many consumers who develop those skills will be unwilling to learn how to use a new product, which will give advantage to the incumbent technology, the provider of which may be able to charge a price above its competitive level to recoup innovation expenditures (Baumol, 2002, p. 113).[3] There are also situations however, where consumer switching costs actually are an impediment to technological progress. The presence of high switching costs can be detrimental to innovation because it tends to "buffer consumers from information about competing technologies and derives continuous commitment to incumbent technologies" (Pae and Hyun, 2006, p. 25). This is not surprising as technology-driven markets are characterized by a high level of uncertainty; more particularly when technologies are quickly replaced and information relevant to consumers are temporarily absent.

This paper provides a survey of the links between innovation strategies and consumer technology patronage via switching costs. The paper will essentially focus on product innovation, regardless it is incremental or radical.[4] Baumol (2002, p. 154—155) defines product innovation as one that shifts the demand curve for the affected final product to the right.[5] Models where there is no patent protection will be

1. Von Weiszäcker also suggested the term substitution cost that in no longer used.
2. As far as we know, Nielson (1996) is the sole addresses the issue of buyer switching cost in the case of business-to-business marketing relationships. In that paper, the concept of switching cost investments and transaction-specific assets à la O. Williamson are synonymous.
3. This idea that innovative firms cannot survive if their pricing approach precludes recouping R&D investments dates back to Schumpeter (1942).
4. From a consumer perspective, radical innovations "refer to innovations that are new to the ... industry; which incorporate a substantially different and new technology; and which provide substantially higher customer benefits relative to current products...". This is to be distinguished from incremental innovations that "refer to improvements in a firm's existing product offerings that better satisfy the needs of its current and potential customers." (see Varadarajan, 2009).
5. Basically, product innovations create new goods and services (Tirole, 1988, p. 389). If successful, a product innovation will increase final-product output, but its general effects on price and welfare notably depends on the shape of demand parameters, and hence on consumer switching costs.

discussed. Moreover, the effect of switching costs due to direct network externalities will not be addressed in this survey.[6] The survey does not totally ignore network industries, using examples from broadband Internet, computer software and banking. Finally, consumers here are buyers in the retail market.

Given the variety of components of consumer switching costs, it is worth emphasizing that "Consumer switching cost" is an all-inclusive term that may lead to some confusion, more particularly regarding the distinction between 'good' or 'bad' switching costs, perceived or paid switching costs, and between switching and search costs. Regarding the former distinction, our classification follows the literature by separating exogenous (they affect all firms similarly and are intrinsic to the product itself; Chen and Hitt, 2005) and endogenous switching costs (induced by a firm's marketing strategy) where only the latter are subject to specific manipulation by firms to render consumers 'captive'. Perceived and paid switching costs are identical, and search costs as part of switching costs. Distinguishing the former two costs is not important if non-switchers perfectly know what their switching cost would be, should they switch. The rationale for not disentangling search from switching costs is that for most individuals, running the risk to switch without entering a search process would be too hazardous a decision. To put it another way, switching always involve some degree of search.

Consumer switching cost theory has matured to the point that some classification of switching costs for both understanding innovative firm behaviour and building policy-oriented models is necessary. Several components of switching costs (lock-in factors) that are relevant concerning firms' innovation behaviour are thus listed in Section 2. In Section 3 we survey the existing literature on the effect of switching costs on innovating firms' behaviour and the way they compete for consumers. Section 4 raises important regulation and competition policy questions, using broadband Internet as main example. Section 5 concludes.

2. Definition of relevant consumer switching costs for product innovation

"Consumer switching cost" is a catchall term that includes all demand-side factors that affect consumer willingness to switch between products (see for instance Chen and Hitt, 2006, who offer an exhaustive list of types of consumer switching costs in the particular case of Information Technology markets).

Switching to a different technology require specific investments in terms of how to use it (learning cost), because it involves different technical difficulties. For example, changing one's smart phone may require switching to more sophisticated functionalities or to a new operating system. Shy (2002, p. 4) also refers to training cost (see also Chen and Hitt, 2006). Therefore, a consumer already using one technology may consider an alternative as both functionally and qualitatively different, and thus perceive this as a cost for switching to this alternative technology. One interesting case is in broadband Internet where each ISP, by providing its own branded modem, makes it not redeployable in the sense of Williamson[7] (for almost all users modems are not interchangeable between Internet services). Similarly, new product releases in the computer software market can involve significant changes to the user interface. Consumers "must [therefore] weigh the potential benefits of any new features against the time and effort involved in relearning the interface. They are prone to remain with their existing choice options. ... [However], switching to an upgrade module imposes lower switching costs on consumers than shifting technologies entirely." (Pae and Hyun, 2006). The effect of learning costs on customer migration even are stronger when 'bought-in' customers are misinformed about the technologies that are available, and how they work.

6. Farrell and Klemperer (2007) provide an exhaustive survey on this issue.
7. Reference to Williamson's concept of relationship-specific investments by customers was first provided in Farrell and Shapiro (1988), although there is no innovation in their model.

Consumers also have to pay transaction costs which include the costs to consumers of using the market, in Coase's sense. Consumers must find out alternative sellers, and which offers the best price for their needs (search costs). This expenditure on information is an investment (Von Weizsäcker, 1984). In subscription markets, consumers also have to pay transaction costs in closing an account with one's current supplier and opening another with a competitor are systematic. Note that search costs can be significantly lower in some industries, since free ranking services are available for many products on the web (see Chen and Hitt, 2006). But, as noted earlier by Coase, specialists who will supply this information will not eliminate the costs of searching for prices within the market.

Consumers may also have to overcome cognitive (or psychological; see Klemperer, 1995, p. 518; Tirole, 1988) costs. Tirole (1988, p. 110) made the following point that consumers are not reluctant to buy a new product if the psychological cost of trying it is low and the prospect of many future purchases is high. The success of an innovative product is far from certain, which arises from the psychology of gains and losses as developed by psychologists such as Kanheman and Tversky. In innovative markets where product change often requires behavioural change, which entails costs, we think this bias is more particularly important and can easily be considered as part of consumer switching costs. Indeed, the adoption of an innovation almost always involve giving up things we currently have and getting other things we do not have (Gourville, 2004). Prospect theory of Kanheman and Tversky and the endowment effect highlight that the benefit given up will loom larger than the benefits to be obtained. An innovation must thus be significantly better to overcome the biases consumers bring to their analysis. The concept of cognitive dissonance, which refers to people's desire to reduce the psychic "cost" of exposure to information inconsistent with continuing to consume one's product offers a further explanation. For example, one would not search for alternative branded products to avoid the discomfort of learning that cheaper products with similar quality level are available. When the new product is offered by an alternative seller, cognitive costs are likely to increase with brand reputation and experience with one's current supplier.

Transaction costs as defined above are real costs and exogenous. But, firms may also find profitable to lock consumers in by creating endogenous switching costs (endogenous switching costs are also termed as artificial). These lock-in devices designed by firms are not necessarily detrimental to consumers. As suggested by Klemperer and Padilla (1997) consumers may have psychological feelings of loyalty. The resulting loyalty cost (see Shy, 2002, p. 5) arises for example when switching technology results in losing some preferred customers' benefits. In some cases, however, firms may want to behave against consumer's interest. For example, in network industries, customers have to pay cancellation fees that may be relatively high. This type of costs belongs to the set of monopolistic practices listed by Schumpeter (1942). More explicitly, Schumpeter suggested a role of long-period contracts as devices for tying prospective customers to investing firms.

3. Product innovation when consumers have switching costs

The consumer switching cost literature takes individual choice as a root of its models. All models on consumer switching costs rely on the following premise. If a consumer is initially indifferent as between the goods of two competing sellers, the fact of using one of them will change her relative utilities for the products, meaning that she will perceive a cost in switching brands. Consequently, the customer will tend to stick to her past/current product choice (Von Weizsäcker, 1984, p. 1089). These potential barriers to mobility introduce friction into markets akin to entry and exit barriers faced by firms. Although firms can develop devices to lock their customers in, exogenous consumer switching cost is a very valuable resource because firms do not have to invest to create them. According to Morgan and Hunt (1999), "perhaps the most valuable resources are those that are the least mobile, such as consumer loyalty, ...".

It is noteworthy that in a static model with no repeated purchases, horizontal differentiation establishes clienteles, as it is the case in models with consumer switching costs. In models with repeated purchases, horizontal differentiation and switching costs are not the same concepts as shown by Klemperer (1987), however. One rationale for this is, as pointed out in Von Weizsäcker (1984, p. 1088), that the information that consumers must gather about competing firms and their products is like an investment, the effect of which necessarily is of an intrinsically intertemporal nature. In models with consumer switching costs, firms are induced to introduce new products at low prices or with special offers to get people to try the product and develop the habit of buying it (Mueller, 1997, p. 836). They may be willing to even incur losses in the process, because they may charge higher prices over their existing customers for repeated purchases.[8]

The effects of consumer switching costs on the decision by firms to sell differentiated products are well understood (see Farrell and Klemperer, 2007). These effects on innovative firms introducing a new product have received little attention, however in the theory literature in economics. Several results emerge from this literature. They are surveyed in the following sub-sections. Let use examine these results.

3.1. The retention-acquisition trade-off for innovative products

When a firm has a fraction of its consumers who are attached to it, this lack of consumer mobility can lower this firm's incentive to innovate unless one or more competitor comes out with a new product that consumers value significantly more. Innovative firms launching a new product face the retention-acquisition trade-off (often termed as *harvesting vs. investing*) pointed out in the early literature on consumer switching costs when firms do not innovate (see Klemperer, 1995 for a concise presentation of this issue, or the more recent survey of Farrell and Klemperer, 2007). The incumbent firm can temporarily elevate its price so as to recoup its innovation expenditure. But this strategy, known as harvesting, makes the firm more vulnerable to undercutting by one or more competitors offering a similar product. This strategy can also be outweighed by the firm incentive to charge lower prices to acquire new customers who will be valuable repeat-purchases in the future (investing).

It is noteworthy that entrants do not face such trade off in setting prices.[9] They do not necessarily price low. In his model with a durable good and a vertically differentiated entrant that may or not innovate, Gerlach (2004) indeed shows that switching costs affect pricing in an unexpected way.[10] For example, if the entrant introduces a drastic innovation, it tends to set its price at the monopoly level. The first reason for this can be attached to consumers' behaviour: "[b]uying the old technology in period 1 implies the risk of being locked in and not having the flexibility to later purchase a new technology." (ibid, p. 189). Consumers are more willing to buy at a high price in the second period because " ... it is more likely that they will buy the new major technology anyway." (ibid, p. 188). The second reason is that the incumbent chooses a price-quantity pair for the first period such that high-willingness to pay consumers stay in the market in the second period (the less consumers served in the first period, the higher the price in the second period and the less consumers are willing to wait).

8. This is termed as *bargain-then-rip-offs* in the literature.
9. This trade-off is more an issue when firms have to set a single price (Klemperer, 2005). To avoid it firms can set more sophisticated pricing policies over time. Firms practice third- (bargain then rip-off) or second- (non-linear pricing) degree price discrimination. This has as consequence that marginal cost pricing will generally not be viable for oligopoly firms undertaking innovation (Baumol, 2006).
10. This author captures the effect of switching costs by assuming that a proportion of consumers are locked to the old product in the second period provided they have purchased it in the first period from the incumbent (only switchers buy the new technology to the entrant in the second period). A distaste parameter differentiates consumers with respect to their willingness to pay (Gerlach, 2004, p. 186).

3.2. Product innovation, timing of innovation

Once the firm has built a customer base, "with incremental innovations it can enhance the salience of non-price criteria vis-à-vis price in buyers' choice decisions. Such a strategy will enable the firm to enhance its financial performance, provided the *marginal* cost associated with the incremental innovation is lower than the increase in price that the incrementally innovative product is able to command in the marketplace." (Varadarajan, 2009). For example, "incremental innovations that manifest as added new features in a firm's current product offerings suggests that those added features provide positive differentiation by giving a product perceived advantages over competitors' products. Consumers seem to use added features in an instrumental-reasoning process that makes the brand with more features appear superior in a choice set." (ibid, 2009). But, purchasing the presently available product implies lock-in and entails the risk of economic obsolescence from a future innovation (ibid, p. 184).

To our knowledge, Beggs (1989) is the first model to study the effect of consumer switching costs à la Klemperer on innovation. Assuming decreasing average costs and a sufficiently large switching cost, Beggs (1989) provides a theoretical foundation for the observation that the less efficient technology may be adopted by firms when consumers have switching costs. Consumers differ with respect to their valuation of the product/service they purchase but they are not attached differently to the different brands (identical and exogenous switching costs). It is nonetheless important that the switching cost be sufficiently large to rule out the possibility of subscribing to another seller in a later period. Note that the condition that consumers' preferences exhibit direct network externalities is not necessary for Beggs' result to hold. Switching costs and decreasing average costs together generate an indirect network externality, in that the greater the population of consumers who buy a firm's product, the more likely it is to survive and the more attractive it is to other customers, regardless of whether this product performs better. As this firm's price would inevitably be low if it wanted to serve all customers, thus, any consumer could expect a low price should he or she select that firm, provided that all other consumers select that firm too. Schematically, the utility of each firm *a*'s customer, using technology 1, does not need to increase directly with an increase in the total number of consumers adopting technology 1. Beggs (1989) suggests that it is likely to increase with an increase in the number of consumers subscribing to *a*. In the author's words (p. 437): ". . . the more consumers who buy a product the more likely it is to survive and the more attractive it is to other consumers."

But the model does not capture essential features of several industries, which we believe are brand differentiation and the perceived cost of learning how to use the different (albeit substitutable) technologies. A competitor offering an alternative technology knows that it may not be easy to attract the incumbent's customers as they would be obliged to learn how to use the new technology. Moreover, firms rarely enter the market simultaneously and there is a long-established incumbent competing with new and aggressive entrants. Ghemawat (1991)'s model goes a little farther than Begg's by considering a three-stage game (innovation decision, entry then production) where consumers have a preference for a second-generation product. This second-generation product is innovative enough (drastic innovation) to obsolesce the incumbent's leadership. One rationale for this is that unlike the entrant that has nothing to lose, the incumbent fears that introducing a second-generation product will cannibalize its first-generation product. By using quite general assumptions (e.g. multiple entry threats), his model provides useful insights on the role played by consumer switching costs on technological inertia.

Finally, in their model of financial innovation when consumers have switching costs, Bhattacharyya and Nanda (2000), find that when the cost of delayed adoption is small, the amount a client can be charged for a new product is limited since she can always wait until competition from rivals drives down the price. A consequence of this is that once a large base of customers invests in one provider's

technology (installed base; see Shy, 2002, p.5), that provider may have no incentive to design one or more of the alternative technologies already supplied by competitors (see Krafft and Salies, 2008 who reached to the same conclusion in the case of the French broadband Internet market). The role of incumbent size is explored below.

3.3. Market share, firm size

Switching costs grant firms with some degree of monopoly power which they may want to exploit in order to maintain or increase their market shares. As pointed by Bhattacharyya and Nanda (2000), the possibility of a positive association between market share and incentives to innovate was first raised by Schumpeter (1942). It is outside the scope of this paper to review the innovation-size literature, but everyone agrees that a larger market share allows firms to derive greater revenues from a given innovation and, hence, gives it greater incentives to engage in innovative activity. As far as we know, the interplay between consumer switching cost and the size of innovating firms has received only little attention. In Bhattacharyya and Nanda (2000) in the case of banking, small firms have incentives to follow more aggressive introduction strategy (a more valuable innovation at a low price) than large firms in order to induce switching of clients from larger banks. As a consequence, the distribution of market shares across banks is important to the financial innovation process and an asymmetric distribution of market shares supports a higher level of innovation activity (ibid). A similar conclusion is reached by Ghemawat (1991, p. 170) who asserts that " ... privileged access to a large customer base can shrink the incentives to develop and apply the next generation of know-how."

3.4. Product line enhancing

Consumer switching costs also help explain the existence of product line extension,[11] simply because with a complete line of products a firm can more easily develop brand loyalty (Tellis, 1986, p. 156). In an oligopoly market where one firm pays a sunk cost to sell an additional product and consumers from competing firms have shopping costs, the innovator can also glue its consumers on the old product (Klemperer and Padilla, 1997). Bu increasing its product line economies of scope arise on the demand side, which increases the cost of switching to single-product alternative sellers (ibid, p. 473; and see Chen and foreman, 2006 for an application of this concept to the router and switch market). As asserted by these authors, the "firm that sells [the new product] is a more attractive firm for consumers to buy [the old product] from." (ibid, p. 475). This result supports the existence of multiproduct firms when consumers value variety (Klemperer, 1995, p. 533). It also suggest that brand extension, as it exploits consumer loyalty, puts firms that sell a single product only at a serious disadvantage relative to a full-line producers (ibid).

3.5. Announcement, entry and reputation

Switching costs more often act as a barrier to new entrants by making consumers favour incumbent technologies (Gerlach, 2004, p. 22). Preannouncement of a new product is thus an effective mechanism when consumers have switching costs: " ... sending strong signals of market commitment to potential consumers ... are ... associated with consumers' expectations for relationship continuity with the incumbent product/technology." (Pae and Hyun, 2006). Several examples exist in the computer software market where firms like Microsoft use preannouncement to help consumers avoid switching costs. Gerlach (2004) asks whether announcement of a vertically differentiated product can facilitate entry of an innovating firm when a fraction of consumers is locked-in on the old product. His main conclusion is perhaps that the size of consumer switching costs not only affect pricing but also the decision to announce entry. Though the high levels of switching costs may act as barriers to entry,

11. The term « shopping costs » is preferable here (see Klemperer, 2005). But, for the sake of consistency, we prefer to stick with that of « consumer switching costs ».

announcements by an innovating new entrant firm may facilitate its entry by lowering the search costs for consumers seeking out new technologies.
Regarding the interplay between switching costs and firms reputation, Von Weizsäcker (1984) developed the appealing idea that when firms have to invest in reputation, constant prices can be interpreted as resulting from the existence of consumers' switching costs. By maintaining its price constant, a firm reduces the switching cost of its rivals' customers, more particularly those due to uncertainty, because its pricing policy is more transparent. We are not aware of such model, although evidence exist in several markets.[12] Pae and Hyun (2006, p. 21) used a similar argument in the computer software market: "firms that divulge future product plans to consumers ... are likely to forestall consumers moving from incumbent technology to other technologies, as consumers know when they can expect upgrades of existing technologies. As an example, Microsoft preannounced Windows NT to protect its customer base from release of IBM OS/2.2.".

3.6. Patent protection

The role of consumer switching costs should thus be importantly weakened when there is patenting because patenting prevents competitors from freely imitating a firm's innovation during several periods. A simple way to model non-patented innovation is, as in Bhattacharyya and Nanda (2000, p. 1102), to assume that the lack of patent protection leaves firms with only a single period to recover their innovation expenditures (see sub-section 3.3).

4. Regulation of innovative markets when consumers have switching costs: application to broadband Internet

As long as switching costs are voluntarily established by consumers (e.g. psychological feelings of loyalty), there is a minor role for competition policies. As we saw above, they can be useful devices for temporarily ensuring some degree of monopoly power that firm seek so as to recoup their innovation expenditures. But, consumer switching costs may be subject to manipulation by firms as we asserted in Section 2. Given this dual nature of consumer switching costs, competition authorities may find difficult to determine why and when switching costs are to be condemned or not.

Let us pursue this section with a concrete example from broadband Internet showing the difficulties faced by regulators and competition policies when they have to decide upon reducing the detrimental effect of consumer switching costs on innovation. Despite supporting entry of new ISPs, the French broadband Internet industry is undoubtedly characterised by important inertia phenomena in terms of choice of technologies, and in terms of providers. This is problematic since one of the expected consequences of the emergence of the innovation 'broadband Internet' in France (and in Europe as well) was the creation of real competition between technologies. What was intended, especially from the regulators' viewpoint, was a decisive contest between the incumbent's choice of technology (DSL) and alternative technologies (such as cable or Wifi) supported by new entrants providing high quality packages at cheaper prices. While broadband Internet can be provided by different technologies, the DSL-based technology largely dominates (in December 2005, Cable represents 4.5%) with the incumbent, France Telecom, still having the lion share of end-consumers (48.6% in December 2006).

Consequently, if regulation and competition policies ignore switching costs, then reluctance by consumers to switch suppliers can lead to a lower innovation rate (see Waterson, 2003 for evidence in several retail markets, including non-innovative ones). Further measures to stimulate competition may not bring more innovation, affecting productive efficiency in the short run (exit of potentially efficient competitors), and dynamic efficiency in the longer run (elimination of higher quality/cheaper price

12. Von Weizsäcker (1984) assumed that firm price is constant over periods but firms do not innovate in his model. They are differentiated by some transportation cost à la Hotelling and consumers have to pay a cost to switch.

emergent offers). Making technologies more transparent to consumers could be as important. Product announcement by innovative entrants can serve this purpose, and as such truthful information about products is pro-competitive and should be encouraged by the regulator. But, this should not preclude information that adopting a new technology may involve sunk costs for most consumers. Firms may have to subsidise those costs to attract customers. Therefore, too low switching costs may discourage firms from subsidising these costs since they cannot be certain that they will keep their consumer base. This might induce them to favour technologies that require less learning, and possibly involve lower levels of innovation. This is certainly the reason why in the early stage of the market development, firms mainly advertised their offers based on price and speed where the latter clearly is an element of vertical differentiation.[13]

Krafft and Salies (2009), from a policy perspective, emphasises that the existence of consumer switching costs in new industries reinforces the importance of competition and regulation policies co-existing while playing different roles. Regulation is needed ex ante and over time to assess and diffuse consumers all information required to appreciate their switching costs whilst competition policy should act ex post if the switching costs remain high over time despite the switching expertise developed by the regulator. A rationale for this is that purely deregulated situations – even based on strong competition policy principles – led to inefficient outcomes when innovation and consumers' switching costs are involved. Besides, the increasing role for competition laws over regulation rules has not eliminated the existence of switching costs.

Finally, competition policies tend to apply uniformly to all sectors whereas the types and degree of consumer lock-in is industry-specific. For example, retailed electricity is a quite homogenous product, at least from consumers' perception and in addition retail activities embody sunk costs of operation. This implies that pricing in the market is not particularly competitive (see Waterson, 2003, pp. 137—141 who addresses the issue of consumers' switching costs between electricity retailers). Therefore, there was not much to say about regulation and competition policies targeted at innovative entrants in retail electricity markets compared to broadband Internet where new entrants tended to offer products vertically differentiated in terms of speed of connection.

5. Conclusion

This survey leads us to conclude that, although switching costs create dependence and inertia in technology-driven markets, the introduction of new products is likely to remain one of the most common strategies for signalling current users to stick with incumbent technologies. More particularly because "products become more complex, and services become more important" (Klemperer, 2005). Pae and Hyun (2006, p. 21) seem less optimistic however regarding the effect of consumer switching costs on new entrants launching incremental innovations into high-technology markets: "... where a dominant technology emerges, switching costs may make its position unassailable unless there is fundamental shift in the technology paradigm." This suggests that consumer switching costs could be a driver of drastic innovation by new entrants in highly competitive markets.

This survey also gave us an opportunity to explore several concrete examples, yet empirical/econometric analyses or well investigated case studies on the role of consumer switching cost on innovative firms are largely lacking (see Klemperer, 2005 who also points out other limits of existing empirical studies). There exists a literature on the effects of switching costs on buyer choice of vendor and on new product adoption in the market for routers and switches in the US (see e.g. Chen

13. The range of speeds provided by a firm warrants future research as an element of vertical differentiation common to all firms while they would be differentiated with respect to switching costs. This assumption remains speculative in the French context as no household survey is available regarding customers' choice of broadband ISPs.

and Forman, 2006 and the references therein). In the software computer market, which is driven by quickly changing technologies, Pae and Hyun (2006) have shown that consumer switching cots encourage technology commitments and technology commitments secure return patronage of incumbent technology. Ghemawat (1991) analyse the effect of consumer switching costs in the private branch exchange industry after noting that incumbents tended to lag in both product innovation and imitation and that patent protection was unavailable. In the case of video game consoles, which are a consumer durable, Gerlach (2004) examined the effect of announcement on entry and pre-emption when consumers have switching costs. His results should be relevant for our understanding of barriers to innovative entrants in industries such as TV sets and other consumer durables (or more generally electric appliances). For example, the increasing interest for smart meters, enabling technologies and consumption control devices in electricity suggests the emergence of a non price competition phase with environmental-friendly products as a competitive weapon. Experiences from other industries witnessed in the literature suggest that incumbent firms who generally hold the majority of retail customers will have some advantage in introducing such products. This should accelerate the diffusion of smart meters. But it might also happen that the less efficient technology wins.

This paper also provided examples of application to ISPs innovation although, one has to recognize, this industry is less innovative than it used to be. Measuring the per-customer switching costs as between ISPs offering broadband, it is possible complete the supply-side analysis of the reasons for technological inertia. Supply side inertia such as the first-mover advantage is pointless here as an explanation as the incumbent entered quasi-simultaneously with other firms. These authors concluded that consumer switching costs must have been high so that the dominant technology is that of the firm with the largest number of customers. Assuming consumers have developed brand loyalty, the incumbent had little effort to make to attract its fixed-line consumers on basic DSL. Besides, by offering access to Internet the firm showed itself as innovative. Accordingly, low switching rates would be a cause not only of consumer inertia (high switching costs) but also of technological inertia. Investigation of the role of consumer switching costs in other innovative industries could help answering the question of whether this type of market imperfection actually is welfare-enhancing or not.

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