

Bundling Strategies, Competition and Market Structure in the Digital Economy

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Abstract

This paper examines the implications of bundling strategies on competition and market structure within and around digital markets. In particular, we consider the bundling of commodity with information good. This explains the benefits telecom firms expect from bundling their complementary services with information goods. But bundling may also be used as an entry strategy in the telecommunications sector by a firm coming from an independent market and leveraging its strong consumer base (such as a service company or utilities).

1 Introduction

With the acquisition of TCI, the US no. 2 cable TV provider, AT&T unveiled in 1998 a daring strategy aimed at transforming the long distance company in the first one-stop shop for household communications services. Through successive acquisitions of cable operators and local phone companies (for a total amount exceeding \$100 billion), the goal is to regain the access network AT&T lost after the 1984 breakup and the creation of the regional Baby Bells. The overall vision pushed forward by the CEO M. Armstrong is "to bring the first integrated package of communications, electronic commerce, and video entertainment services". The expected benefits from a bundled offer are twofold: to attract new consumers because the more services in

the bundle, the greater the consumer's satisfaction and the savings, and at the same time, to reduce the churn, very high in the long distance business and irresistibly denting the margins. However, only two years later, AT&T announced in October 2000 that the company will be split into four separately traded stocks: wireless, broadband, consumer and business. It is claimed that a formal separation will ease strategic internal conflicts and improve each component's ability to raise debt and conduct mergers or acquisitions with its own stock currency. To many analysts, this spectacular U-turn also means the indisputable failure of an attractive theory (bundling and its marketing expression of "one-stop shopping") but never really put into practice. And this is a general result, it is claimed, referring to the present worldwide wave of divestiture amongst the main telecom players. In the UK, the incumbent telco BT, confronted with a growing pressure from the financial markets over the year 2000, eventually announced a similar breaking up decision, with a separate partial flotation of the Internet, businesses services and wireless division.

This story illustrates one of the most striking features of the emerging digital economy around Internet and electronic commerce: the generalized use of bundling goods and services (multiplication of flat rate access to all kinds of services, very large aggregation of information goods). At some point, marketing and management pundits asserted bundling is an essential condition for a successful e-business model, and offered it as the central explanation to the massive wave of mergers and acquisitions experienced in the IT industries throughout the 1990s. However, while the potential for transaction costs savings and scale economies offered by Internet is widely acknowledged and investigated, much remains to be learned on the new associated competitive strategies such as bundling. This paper is an attempt to explore some implications of bundling strategies on competition and market structure within and around telecom markets. In particular, we will point out the role of bundling telecom services with conventional goods or services, as an entry strategy for a non-telecom firm coming from an independent market with a large installed client base.

The underlying motivation for this paper is twofold. First, bundling is likely to play a major role in the future competitive and industrial landscape of telecommunications. But probably not as it was widely expected, hoped or feared. For example, moving from an approach of bundling strictly restricted to information goods, we will here demonstrate its role as a powerful entry device in the telecom markets for an outsider firm. In any case, there is clearly a need to rigorously review the economic rationale of this

bundling strategy presented yesterday as the marketing "killing solution", and now severely criticized. Then taking into account the special characteristics of present competition and industry structure in telecoms, we can suggest an alternative rationale for bundling by telecom incumbent providers. More than costs savings, entry barriers or price discrimination, its primary objective is to raise customers' switching costs. Bundling can then be understood as a strategy to escape from what we may call the telecoms economic dilemma: huge capital investment but low switching costs giving poor market control and successful commoditisation, entry and reselling strategies. The stock market turmoil of telecom companies during the year 2000 actually hides a more fundamental issue: in this sector, the world liberalization of markets combined with fast technological change makes it possible for new firms to enter at almost every level of the value chain. In upward segments, this means increasing pressure on prices, and eventually, commoditisation of capacity and transport services. On retail markets, because of low switching costs and fast technological change, telecom companies find it very difficult to retain their customers, who can easily contract to other providers with cheaper or more attractive services. Those new entrants or resellers get then control over the crucial interface with the customer. Traditional telecom operators are stretched between these two forces: their network infrastructure does not guarantee them any more the control of the final products and their customers ; however since it still constitutes their major asset, they have to continuously invest huge amounts of capital to modernize it and to catch up with the innovations introduced by the last entrant. To avoid that, they pursued different strategies: external growth (to achieve scale economies and to add new services), diversification of mobile services to better capture their customers, creation of complementary services such as a portal or a Internet access provider, and finally bundled offer. In this perspective, bundling is central to the analysis of competition, entry and market structure in telecommunications.

Our second motivation is to investigate the micro foundations of the so-called "convergence" process in IT industries. It is widely considered that the most important development in telecommunications is "convergence", and the integration of voice, video, and data into one communications technology. Traditionally separate industries, such as computer and software, telecommunications, Internet, and cable television providers are now quickly evolving into a single communications industry. So far, this concept mainly relies on technological considerations, illustrating quite convincingly the scope of convergence: voice telephony on the Internet, broadband access through cable networks, or video on an ordinary residential copper line...

However, the economic dimension of the process is still to be systematically explored. The lack of rigorous and homogeneous data at the industry or firm level is for the moment a major obstacle to empirical IO or econometrics studies. A regional approach is therefore interesting as an aggregate proxy. The analysis of IT jobs evolution across the US suggests the existence of Jacobs-type diversity externalities, where the co-location of IT industries (telecom, cable, ISP, data processing, computer system, software) fosters employment growth (Le Blanc, 2000). Moreover, IT clusters' creation and development are now increasingly examined from a theoretical and practical perspective (Porter, 1999 ; Quah, 2000, 2001). This paper also intends to contribute to this debate by exploring how bundling could drive convergence at the industry level. When looking for an economic explanation of IT convergence, bundling is actually a logical candidate. Besides, since it basically works on production costs differences and individual preferences distribution, it offers a practical mean to isolate "pure" market effects. But there is a priori no reason to limit its field only to IT firms. To specify the effective role played by bundling in IT convergence, we therefore need to push the analysis one step further. This gives a second justification for studying bundling strategies by an outsider firm to enter IT markets such as phone, Internet access or cable television.

The paper is organized as follows. The next section surveys the economic and marketing literature on bundling to specify the changes introduced by Internet and the electronic commerce. Basic models of bundling commodity product with information goods are then described in section 3, and the implications for price and competition presented. In section 4, we examine empirical cases of bundling in the telecommunications and Internet markets. We spot two different approaches: i) the bundling of an entire range of communication services by telecom firms to retain their customers and to protect their core market, ii) the bundling of phone or Internet services with their main product by outside service companies, to successfully enter the telecom market. Conclusion summarizes the general implications of pervasive bundling strategies in the digital economy, in particular the resulting challenges for the existing regulatory framework, either sector regulation or competition law.

2 Bundling Economic Motivation: a Survey

Bundling consists in the sale of two or more differentiated products in fixed combination in a single package. This can be considered as a sub-category of tie-in sales, which apply to situations where the sale of one product is somehow made conditional on the purchase of another. No need to illustrate the prevalence of this practice in the business life: consider for example travel companies bundling flights, hotel, car rental, and accommodation in a vacation package, restaurants where you choose between a set dinner and à la carte menu, computer offers combining central processing unit, software, display, and printer at a single price, and of course Microsoft Office and its software applications. Bundling raises a number of interesting issues. The first of them is without doubt: why?; in other words, what is the rationale and the motivation in bundling two or more goods? Then one might wonder: will it be beneficial to society or not? Should the government interfere with the process to regulate and possibly forbid such transactions? If so, on which legal justification and based on what kind of economic evidence and argument? Here, the main concern is that bundling could be used as an instrument to extend market power, foreclose and monopolize new markets. These questions have given birth to a vast theoretical and empirical literature.

The aim of this section is not to review systematically the economic literature on the causes and consequences of bundling. Rather, we suggest to investigate how the different economic models apply to the development of the digital economy, in particular how their assumptions and main hypothesis fit with the case of telecom services and information goods. And, since we are mostly interested in the consequences on competition and market structure, we will not review in this section the great number of (conflicting) results on the welfare effects of bundling. Note first that we are not short of economic explanations to bundling. Quite the opposite, there are many alternative and/or complementary theories available. Here is an indicative list of the several incentives put forward for a firm to bundle:

1. to leverage its market power in other markets, reduce rivals' profits and drive them out of the market,
2. to achieve better price discrimination,
3. to save production and transaction costs,
4. to deter entry and/or to harm entrants' profitability,
5. to credibly commit to aggressive innovative policy and cost-cutting R&D investment,
6. to exploit complementarities between the components.

However, these various explanations refer in fact to a wide range of different models. Therefore, to get a clear picture, one must pay careful attention to the assumptions used. In particular, one must consider the three following points: i) the market structure for each good forming the bundle (in each case, monopoly, oligopoly or perfect competition, and then every combination possible between them), ii) the correlation in the consumers values for these goods (independent, positively or negatively correlated), iii) the existence or not of complementarities in the bundle, either in consumption (system goods...) or in production (scope economies).

A first group of contributions is based on a monopoly setting in one of bundled good, and explores the so-called "leveraging market power theory". Basically, this notion, developed along a long line of law cases (mostly in the 1940s and 50s), claims that bundling is a mechanism used by a firm with a monopoly power in one market to monopolize a second market. But, with a lack of convincing rigorous theory backing this suspicion, the validity of the leverage theory was later questioned and successfully discredited by Chicago school's criticism (Posner, 1976 ; Schmalensee, 1982). The argument is that a monopoly has no interest in inducing some customers through a bundled offer to buy the competitively supplied product, when they would not have acquired it separately because they value it under its production cost. Since the tied market is perfectly competitive, the product is sold at the marginal cost. The evaluation of the bundle then simply amounts to the sole evaluation of the good monopolistically supplied: does the customer value it more than the difference between the bundle price and the tied good separate price? This criticism was publicized in short as: you cannot make two monopoly profits out of one monopoly. Accordingly, the motivation to bundle must be found somewhere else and first in price discrimination.

However, during the last ten years, a number of contributions revisited and revived the idea of leveraging monopoly power through bundling. First, Whinston (1990) points how bundling can be used to alter the tied good market structure, whenever this market departs from the perfectly competitive structure with no scale economies assumed in the above critical literature. In the presence of scale economies and strategic interaction (oligopolistic markets), bundling actually turns out to be a profitable strategy. In the Whinston model, this is obtained through the exclusion of rivals by foreclosure of the bundled market; bundling makes continued operation unprofitable for rivals and eventually induces them to exit. This requires some form of credible commitment to sell the goods only in the bundle. The exclusion of the rival firm is not necessary when the bundling monopolist can exploit strategically

the expected reactions of the rivals to the introduction of a bundled offer. For example, in a Cournot competition, bundling alone brings a favorable response from the rival firm increasing the monopolist profits (Carbajo et al., 1990). The second group of results shows that bundling can also, in a completely opposite way, work as a facilitating device. Its potential to reduce competition through differentiation is emphasized: creating a bundle enables to avoid head-to-head price competition in the duopoly market (Carbajo et al., 1990 ; Chen, 1997). Here, bundling amounts to dividing the market between the two firms according to the customers values for the competitive product. Finally, Choi (1996, 1998) highlights the importance of considering the role of innovation in the analysis of bundling. This is illustrated by the recent antitrust case involving Microsoft where the claimed negative impact of tying on innovation was one of the main debated issues. Putting aside the traditional allegation on monopoly power leverage, competitors and DOJ's antitrust division actually argue that bundling strategies pursued by Microsoft (such as operating system with Internet browser) stifle innovation. In this context, Choi notes that most existing studies are inadequate because they focus on static price competition. Adding an R&D investment stage in the competition game (to reduce cost production in the final stage), he demonstrates that tying may be profitable through its effect on innovation, and the dynamic rents it offers to the monopolist. Bundling increases R&D incentives in the tied good market, as the gained market share allows to spread R&D costs over a larger scale of production. At the same time, an induced strategic effect of bundling is to reduce, even eliminate, incentives to invest in R&D for the rival firm (the market foreclosure mechanism translates here to the R&D and innovation market). Therefore, the bundling firm can capture a larger share than its rivals of the rents created through R&D. These dynamic gains will make bundling a profitable strategy, if they exceed the losses from an intensified price competition in the bundled market. In this case, Choi (1998) underlines that the exclusion of the rival firm is not necessary.

As a result from the attack on the idea of monopoly leverage, focus was put on the role of bundling as an instrument for price discrimination. Extending a first discussion by Stigler (1963), Adams and Yellen (1976) offered a seminal contribution in that direction, which contains in an intuitive form or remarks most of the main results that will be demonstrated later in the literature. In this paper, they basically compare separate sales with pure bundling (the two goods are only sold in the bundle) and mixed bundling (both the bundle and the individual goods are offered) for a multiproduct monopolist. They show with stylized examples how the bundling strategies

of two goods can be profitable, even in the absence of cost savings. The idea is that bundling helps to sort consumers into groups according to their reservation prices and reduces the heterogeneity in consumer's valuations. This last point typically prevents a firm charging one price from capturing perfectly the consumer surplus. And the optimal response of pure price discrimination must face several implementation (data on individual reservation prices) as well as legal obstacles. Bundling can then be understood as a very efficient way to implement in practice price discrimination. Since it induces a self-selection of consumers, it is far less information demanding (only the joint distribution of reservation prices in the population is necessary) than the theoretical solution where you must collect the individual customer's willingness to pay for each good. At the same time, it avoids the regulations forbidding explicit discriminatory pricing (a single price for the package)

However, effective bundling requires that the resale of components among buyers is prohibitively costly or prevented in some way. To be free to charge the profit-maximizing price in the inelastic markets, the firm must actually prevent any resale from the markets with the highest elasticity of demand, where it is forced to price at a lower level. When comparing the three alternative pricing strategies, Adams and Yellen found several cases where mixed bundling is preferred to pure bundling. The reason is a basic inefficiency of the pure bundling: a less complete degree of exclusion. There is actually a trade-off between better extraction of the surplus and complete exclusion. Namely, when production costs are significant, there is a growing risk to supply customers with goods for which their reservation price is below cost. There is no unique optimal result though: the superiority of each strategy depends on the level of costs and the distribution of reservation prices. The paper also suggests that bundling works best when there is a negative correlation between the reservation prices for the individual components of the package. The reason is immediate: in that case, the bundle offer will actually have homogeneous valuations among consumers and the firm will capture the entire surplus.

Schmalensee (1984) formalized this result and demonstrated that it still holds when demands are uncorrelated and even positively correlated. He also explicitly developed this classical interpretation of bundling, as a mean to reduce the diversity of buyers' valuations, which helps to extract more surplus from the consumers. McAfee, McMillan and Whinston (1989) examine the conditions under which bundling is an optimal strategy for a multiproduct monopolist. One of their main results is that mixed bundling is always an optimal strategy when reservation values for the various goods are indepen-

dent. Focusing on the case of pure bundling, Salinger (1995) introduced the role of cost savings to interact with demand effects and proposed a graphical analysis of the economic properties of bundling. He explores how bundling profitability depends on the complex interaction between demand effects (correlation of reservation prices), the cost of each good offered in the bundle, and the savings it allows. He demonstrates that the scope of profitable bundling must be extended beyond the classic purely demand-based scenario (low production costs and demands negatively correlated): if bundling entails costs savings and component costs are high, bundling gets more profitable when individual demands are highly positively correlated.

Expanding on the case of oligopolistic environment examined by Whinston (1990), Nalebuff (1999) shows a third role of bundling: deter effectively entry by a one-product rival. In a base model with independent valuations and zero marginal costs, bundling strategy is effective even if deterrence fails and entry occurs. Selling a bundle makes entry less profitable without lowering the profits of the incumbent if entry is deterred. And should entry occur, the loss to the incumbent with bundling is reduced compared with the independent pricing case. He also demonstrates that the gains from entry-deterrence (whether the entrant effectively enters or not) largely exceeds those from price discrimination. And contrary to price discrimination, these effects of entry deterrence work best when the bundled goods are positively correlated in value. Here the market power serves to protect the firm's position on its non-monopoly markets, by deterring entry and mitigating the impact of a new entrant or existing one-product rival.

We rapidly finish this review with the specific cases of complementary goods (Economides, 1993 ; Nalebuff, 2000) and system goods (Matutes, Regibeau, 1992). Price discrimination here plays a minor role because the goods are highly positively correlated in value. But the competition effects are much more deciding. Given the existence of a price externality between the complementary goods, bundling the different components gives an advantage over the separate component sellers; the first firm to bundle increases its market share, and its profits once there are four and more products in the bundle. It is then extremely difficult for rival firms to create an alternative bundle because the competition between bundles is ruinous and would harm them even more.

These three main motivations and effects of bundling are summarized in the following table.

Motivation	Result of a bundling strategy	References
Leveraging market power	exclusionary device (foreclosure of the bundled market)	Whinston, 1990 ; Choi, 1996
	reduce the competition in the oligopoly tied market	Carbajo et al., 1990 ; Chen, 1997
	dynamic incentives to engage in cost-cutting R&D	Choi, 1998
Price discrimination	extract full consumer surplus	Adams, Yellen, 1976 ; McAfee et al., 1989
Entry deterrence	reduces the entrant's potential profits	Whinston, 1990
	mitigates the impact of entry on the incumbent	Nalebuff, 1999

Adams and Yellen introduced the basic conditions for bundling efficiency that shaped afterwards the research agenda on this topic. On the one hand, the relations between the distribution of preferences for each components (negative correlation works best). On the other hand, marginal costs must remain low to limit the allocative inefficiency resulting from oversupply or undersupply to some customers imposed by a bundled offer. Therefore, the research has logically focused on productions with zero or low marginal cost, such as information goods or software (Nalebuff, 1999 ; Bakos, Brynjolfsson, 1999). In this paper, we look at bundling strategies between information goods and commodities and examine cases where one of the production costs is significant and valuations independent or positively correlated.

How does the dramatic growth of Internet, Web users and data traffic affect the bundling strategies described above? Considering digital information goods, one can put forward three key points. First, it facilitates and simplifies the arrangement of a bundle offer and its real-time dynamic monitoring. Secondly, it allows the consumers to easily define themselves the sub-bundle they prefer (McKie-Kason, Riveros, Cazzale, 1999). Third, it significantly extends the scope of attractive bundling beyond the traditional boundaries defined above in the literature. Bakos and Brynjolfsson (1999) explore this last issue when considering the bundling of a large number of information goods by a multiproduct monopolist. They find that this is a very profitable strategy for a broader set of conditions than expected in the literature. Including a very large number of goods in the bundle actually allows a more accurate and fine tuned extraction of the consumer surplus. In an infinite bundle, the law of large numbers even ensures perfect discrimination. To cope with systematic differences in consumer's valuations between some market segments, they introduce the idea of a menu of bundles aimed at each segment. Their paper gives us a nice starting point for analyzing the role of bundling strategies in telecom and Internet markets. The setting borrowed to the price discrimination approach of bundling builds on a multiproduct monopolist. While this could be appropriate to explain the bundling of the entire range of its services by a telecom firm, we must introduce oligopolistic structures

in some of the bundled goods to take into account the present competition in these markets. Secondly, Bakos and Brynjolfsson take care to make clear that their result does not extend to physical goods, where marginal costs of production are too high and will destroy the benefits from the large-scale bundling. However, we believe that the bundling of a commodity with significant marginal cost with information goods is a particularly interesting and challenging topic to study. In any case, this approach is essential to explore new emerging pricing practices in the telecom industries.

3 Bundling commodity with information good

We consider a case where a firm (A) is a monopolist of product 1 and sells another good (2) in competition with a rival firm (B). The two products are independent and indivisible and consumer purchase at most one unit of each good. Preference distributions for the two goods are perfectly correlated. Consumers reservation prices are uniformly distributed on the interval $[0,1]$. There is no complementarity in bundle consumption (i.e. the value of a package containing one unit of each good is equal to the sum of the separate values of each good alone), nor on the production side ($c_{Bundle} = c_1 + c_2$). Good 1 is produced by A at marginal cost c ($0 \leq c \leq 1$) and good 2 is an information good produced at zero marginal cost. The game is the following: firm A decides first to bundle or not goods 1 and 2 ; then prices and quantities for each good and the bundle if there is one are determined according to the competitive setting between firms A and B (Bertrand, then Cournot). Following Carbajo and al. (1990), we only consider here pure bundling. These authors argue that, given the preferences assumptions, pure bundling is the most profitable strategy. We can add another point: while mixed bundling is virtually almost always superior to pure bundling (McAfee et al., 1989), it requires in practice that re-trading among buyers is impossible or forbidden. This is particularly difficult to enforce in our case of an information good that can be easily copied and resold. If firm A decides to bundle, it then charges the price P for the package formed of one unit of each good 1 and 2. If not, it offers the goods separately with prices p_1 and p_{2A} . Firm B sells the good 2 at the price p_{2B} . First, note that if the decision is not to bundle then, whatever happens in market B, firm A as the monopoly for good 1 typically supplies $q_1 = \frac{1}{2}(1 - c)$ at price $p_1 = \frac{1}{2}(1 + c)$.

To begin with, we assume that the firms act as Bertrand price-setting in the duopoly market. Without bundling, we get the monopole output for

good 1 (see above) and the price of good 2 is driven down to the marginal cost, i.e. zero. $p_{2A} = p_{2B} = 0$. Equilibrium profits are

$$\pi_A = \frac{1}{4}(1-c)^2 \text{ and } \pi_B = 0$$

If firm A now decides to offer a bundle of a unit of each good,

$$P = \frac{4}{7}(1+c) \text{ and } p_{2B} = \frac{1}{7}(1+c)$$

Consumers are split up into three groups according to their reservation values: when they have high value, they buy the bundle ; those with medium reservation prices buy the good 2 from B ; the rest is excluded from the market. This partition allows firm B to raise its price above the nil marginal cost and to make positive profits. In return, this differentiation allows firm A to set a price for the bundle over the separate price components when there is no bundling. The output produced of the monopolist good 1 also increases. Profits become

$$\pi_A = \frac{1}{49}(4-3c)^2 \text{ and } \pi_B = \frac{2}{49}(1+c)^2$$

Bundling brings an increase in the price and the profits of firm B (though the volume of its sales is reduced if $c \leq 0.75$). For firm A, the difference in equilibrium profits with or without bundling is

$$\partial\pi_A = \frac{1}{49}(4-3c)^2 - \frac{1}{4}(1-c)^2 = \frac{1}{196}(15+2c-13c^2)$$

which is always positive since $c < 1.15$. Interestingly, the change in aggregate welfare $\partial W = \frac{1}{392}(9-10c-19c^2)$ is ambiguous ; it will remain positive while $c \leq 0.47$.

Now consider quantity Cournot type competition in the good 2 market without bundling. The Cournot duopoly output are $q_{2A} = q_{2B} = \frac{1}{3}$ and $p_{2A} = p_{2B} = \frac{1}{3}$. Equilibrium payoffs are

$$\pi_A = \frac{1}{4}(1-c)^2 + \frac{1}{9} \text{ and } \pi_B = \frac{1}{9}$$

If firm A decides to bundle, we then obtain the following equilibrium output levels $Q = \frac{1}{7}(3-2c)$, $q_{2B} = \frac{1}{7}(2+c)$. The price of the package $P = \frac{3}{7}(2+c)$ and $p_{2B} = \frac{1}{7}(2+c)$. With bundling,

$$\pi_A = \frac{2}{49}(3-2c)^2 \text{ and } \pi_B = \frac{1}{49}(2+c)^2$$

Bundling is profitable for firm A if

$$\partial\pi_A = \frac{1}{1764} (11 + 18c - 153c^2) > 0$$

This condition is satisfied for $c < \frac{1}{3}$. In that case, $\frac{1}{7}(3 - 2c) < \frac{1}{2}(1 - c)$; bundling reduces the output of the monopoly good 1. But the effect of bundling is to increase firm A's production of good 2: $q_{2A} = \frac{1}{7}(3 - 2c) > \frac{1}{3}$. The typical Cournot response for firm B is to reduce its output. Finally, for $c < \frac{1}{3}$, in the bundled market, the overall production raises ($Q_2 = Q + q_{2B} = \frac{1}{7}(5 - c) > \frac{2}{3}$) and the price goes down. As a result, bundling is profitable for firm A because it gives her a larger market share in the larger duopoly market. At the same time, it also significantly reduces rival firm's profits. A simple numerical example illustrates these points. With $c = 0.1$, bundling raises firm A' profits by only 2 percent but firm B' profits fall by 20 percent, from 0.11 to 0.09. Depending on the level of fixed and sunk costs, remaining on the market might not be longer profitable for firm B. We find here the strategic dimension of bundling in the presence of sunk costs: making present rival's operation unprofitable and driving him out of the market (Whinston, 1990) or deterring entry by reducing potential profits of a challenger below its entry costs (Nalebuff, 1999).

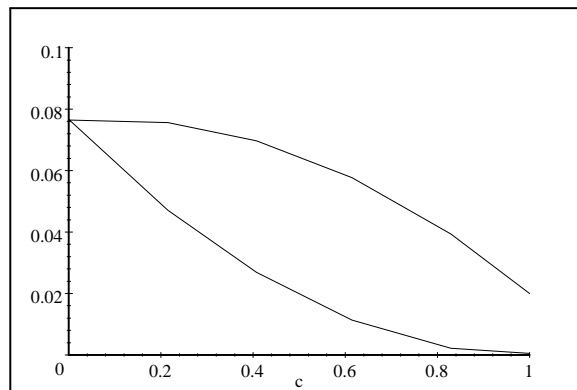
The results of this basic model bundling with an information good are the following. Under Bertrand competition in the duopoly market, the bundling is always profitable for both firms. Bundling actually works here as a differentiating mechanism for the monopolist's product, enabling both firms to avoid a frontal price competition and to raise the price above cost. Under Cournot competition, the mechanism is different and involves, as always with these competition assumptions, an issue of credible quantity precommitment. Bundling gives this kind of signal because it announces a higher output of the duopoly product by the monopolist for a given output of the rival. There is no need here to invoke the sunk costs associated with the design, the advertising of a bundled offer, or adjustment of the production process (Whinston, 1990; Carbajo et al., 1990; Choi, 1998). In fact, this logically happens when the Cournot output of the duopoly product is lower than the sales volume of the monopoly good. But since the equilibrium quantity of packages produced will be set between these two levels, this implies that the monopoly tries to sell more of the duopoly than before. To sum up, the two approaches of bundling are quite opposite: in the first Bertrand case, it allows to reduce the intensity of competition on the bundled market through differentiation, while in the Cournot case, firm A chooses to bundle to credibly precommit to a higher production level in this market.

To understand better the changes brought by this specific kind of bundling, we compare it now with the case where the production cost of the duopoly good is c , equal to the monopoly good cost. With Bertrand competition assumptions, the gain from bundling is then

$$\partial\pi_A = \frac{15}{196} (1 - c)^2$$

With $c \leq 1$, this is always lower than the increased profits brought by bundling good 1 with an information good (see the figure below where the curve describes this gain from bundling for firm A and the dash line the result obtained with the information good 2). Moreover, this benefit measured as a fraction of the former profit level is constant and equal to 30 percent, while in the case examined above, the profitability of bundling increases with higher production costs (e.g. 100 percent with $c = 0.5$).

Figure 1. Information good bundling profitability compared with commodity bundling (Bertrand competition)

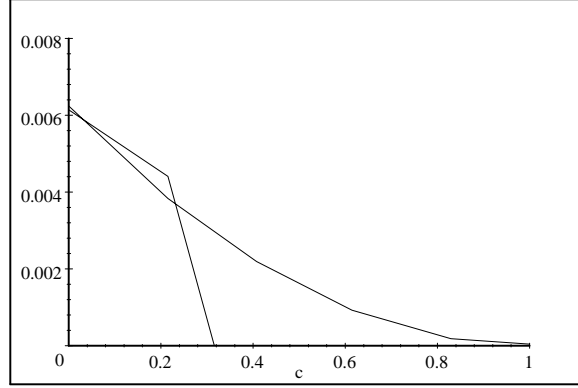


Under a Cournot setting,

$$\partial\pi_A = \frac{11}{1764} (1 - c)^2$$

The situation is here different: if the costs of production of both goods are equal, then bundling is always profitable for firm A. On the contrary, bundling with an information good is profitable only, as we saw before, if $c < \frac{1}{3}$. Firm A will only be better off by bundling its monopoly good with an information good rather than with a good of equivalent production cost if $c \leq 0.24$ (see the figure above with the same conventions as before).

Figure 2. Information good bundling profitability compared with commodity bundling (Cournot competition)



If the production cost of the monopoly good is not too large, bundling this good with an information good dominates the strategy of bundling with a good of similar cost.

As we have seen, the key factor in the outcome of a bundling strategy is how the demands for the separate goods are transformed into a demand for the bundle. To understand this better, Salinger (1995) introduced the nice idea of the "aggregated components" demand curve (vertical sum of the demand curves for each good forming the bundle), which allows a direct graphical analysis of the competitive effects of bundling. Consider again two goods 1 and 2, that might be bundled, with consumers reservation prices uniformly and independently distributed on the interval $[0,1]$. The individual demand curves for each good are linear:

$$q_i = 1 - p_i, 0 \leq p_i \leq 1$$

The demand for the bundle (one unit of each good and only pure bundling considered)

$$Q_{bundle} = 1 - \frac{1}{2}P^2, 0 \leq P \leq 1$$

$$Q_{bundle} = \frac{1}{2}(2 - P)^2, 1 \leq P \leq 2$$

The aggregated components demand curve is obtained by setting $q_1 = q_2 = Q_{aggr.}$ and $P_{aggr.} = p_1 + p_2$. Then

$$Q_{aggr.} = 1 - \frac{1}{2}P_{aggr.}, 0 \leq P_{aggr.} \leq 2$$

Comparing these two curves helps understanding the benefits from bundling for the firm by comparing directly for a given price of the bundle the quantities it would sell (and then the revenues it would get by selling components separately). In the case of independent linear demands, there are two segments: in the first one, large quantities, the bundle demand curve is above the aggregated components demand curve ; then the curves intersect and we have the opposite result for smaller outputs. For bundling to be profitable, we must logically be in the first region. However, one must also check that the sum of the separate profit-maximizing prices for each good does not fall in the range where aggregated components demand exceeds the demand for the bundle. In such case, the firm would prefer selling the two goods separately. Salinger demonstrates that bundling is profitable if the common marginal costs of the goods remains low ($c \leq 0.14$). This result can be extended to explore the role of costs savings in the profitability of bundling. Actually, when the reservation prices for each good are positively correlated, the two curves described above almost coincide ; any small cost saving from bundling then automatically makes this strategy profitable for the firm. And this result holds even with higher production costs.

While the first basic model presented in this section may be useful to examine the bundling of information services with its main services by a telecom firm, the second Salinger model appears particularly appropriate to the case of bundling of different telecom services, where demands are likely to be somehow positively correlated and production costs are definitely non nil. We can then point out that the success of this kind of bundling depends on the effective fulfillment of costs savings in the bundle production and sales.

4 The case of telecoms and Internet access

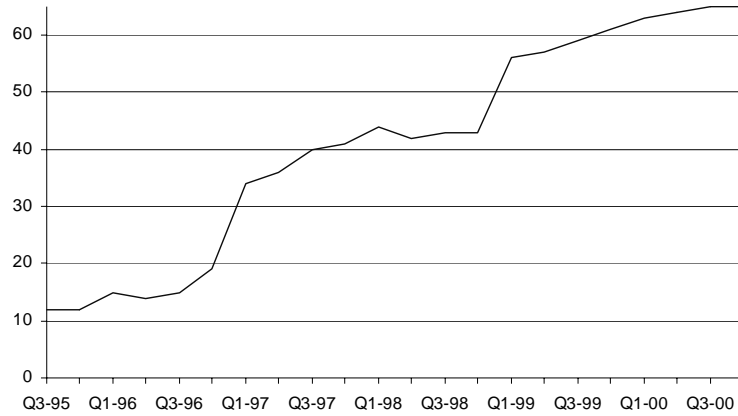
In this section, we examine the different practical use of bundling communications services by telecom (and non telecom) firms. We focus on two distinct cases: the bundling of their entire range of services by telecom providers to offer one-stop communications shopping, and the bundling of phone and Internet services with their main product by service companies such as utilities. The first strategy aims at regaining customer control (giving continuous access to usage data, preferences, records), reducing churn, increasing switching costs, leveraging market power (in so far as presented in section 2) and deterring new entrants in some of the bundled markets. The second one uses bundling as a tool to enter the telecom market, and indicates a radical change

in the strategy of utilities in that field. So far, their activities in telecoms were actually concentrated in the infrastructure side and the valorization of their electricity, gas or pipelines networks through the deployment of fiber optic capacity. Their retail telecom offer bundled with utility supply works on an entirely different model, without investment in a proprietary network. Utilities have therefore negotiated large wholesale contracts with different major telecom providers (exploiting their huge customer base as a potential outlet) and resell the services to their customers in a bundle.

The bundling of their services by telecom firms is well illustrated by the AT&T story described in introduction. But this not an isolated story. In 2000, most of the telcos have contemplated at one time offering their customers a bundled offer of their services as large as possible: fixed telephony, mobile, TV, Internet service, in a single connection. For instance, Qwest Communications has begun selling in Spring 2000 unlimited dial-up Internet access bundled with long distance, online conferencing, and "a whole suite of Web-enabled services" under the *Total Package* brand name. So far, these packages have had mixed success, well below the initial enthusiastic expectations. A survey in the US in 2000 (Yankee Group) finds that only 24% of consumers get local and long-distance services from the same company (that would however be the basic level of expected bundling), 3% with telephone and cable bundled and only 1% with a bundle of telephone, cable and Internet access. That might be a temporary transitory period but still it is interesting to compare that result with other experience of bundling within a single telecom service that proved quite successful.

Actually, bundling was introduced in telecoms roughly at the same time in Europe for mobile phones (with monthly subscription including a given number of hours of communications), and in the US (Internet access flat rate). Interestingly, the argument put forward to explain their success is quite different and involves the preference of consumers for simplicity in pricing. While theory claims that usage-sensitive (time in the case of communications) pricing is effective and efficient, the switching of all the main US Internet service providers in 1996 to flat rate subscription suggests a different conclusion. In less than a year, the Internet usage per person tripled, and the pace could have even been more dramatic, had not been capacity constraints preventing to satisfy the potential demand (see the figure next page based on Odlyzko, 2000 and AOL company data).

Figure 3. AOL users average consumption (minutes per day) 1995-2000



When reviewing the situation on an international basis, it is clear that flat rate has played everywhere a key role in stimulating usage and pushing Internet penetration. Europe experienced a similar story in 1999-2000 following intense lobbying by companies and consumers associations (*"Free the Net"* campaign by the *Times* in the UK in autumn-winter 1999 and *"Arrêter les compteurs"* Stop the Clock campaign by AOL one year later in France). The reason for flat rate success appears to be linked with strong consumers preferences for simplicity and previsibility. The flat rate helps reducing information asymmetries (fear of being cheated by the provider of access service), saves mental transaction costs, and brings an insurance against sudden and uncontrolled rise in consumption. This suggests that the bundled approach is perhaps still incomplete in the telecoms and should try to generate similar changes in consumers evaluations to stimulate demand. To this respect, convergence should not be mistaken for the mere aggregation of various communication services into one billing. A more sophisticated integration, customization and pricing of these services is needed to meet a specific customer's needs. Eventually, this might be the sole comparative advantage of telecom providers, in a market where price and reliability of service no longer gives a decisive advantage because they have become fairly similar across competitors.

This conclusion is reinforced by the parallel move observed of utilities entering the telecom market as resellers of bundles. Bundling here supports a new entry strategy. The implication of utilities in telecom markets is not new. But it was initially focused on the deployment of transmission capacity and wholesale of bandwidth. The case of Williams, one of the largest gas-pipeline

companies in the US, is particularly instructive. Williams first entered the telecommunications market in 1986 by placing fiber cables in decommissioned petroleum and gas pipelines. A new company was created WilTel and the network was rapidly expanded through new construction projects and acquisitions of several local fiber-optic networks to become the fourth long distance network. That pioneered move from energy to fiber network was soon followed by other energy companies like Enron and Duke Energy. In 1995, the telecom venture was sold to the retail provider LDDS, that became WorldCom, and Williams only retained a segment of the network (refocused on video transmission) and its business services activity. In 1998 after a three-year non-compete agreement with WorldCom expired, Williams Communications re-enters the wholesale telecom market as a "carrier's carrier" with the deployment of a new national broadband network. Its customers are local and long distance telecom carriers, CLECs, Internet service providers, media companies, utilities. A strategic alliance was formed with SBC in 1999 providing Williams with a major data and voice long distance traffic. The broadband network project is one of the largest in the US: 33000 fiber route miles connecting 125 cities in the US at the end of 2000 carrying any combination of Internet, voice, data and video services. It incorporates new generation optical networking technologies and equipment, to achieve the innovative fusion of transmission, switching and systems and be able to deliver actual wavelength services. While focusing exclusively on the wholesale market and the supply of network infrastructure and services to telecom carriers, Williams sees a major opportunity for growth in accompanying the utilities' entry into telecommunications. It holds a minority interest in UtiliCom Network, a company which specializes in supporting and managing the telecom diversification of electric and gas utilities, and leveraging their brand and customer base to successfully enter this market. In 2000, the energy group generates more than 20% of its revenues from telecommunications.

This is exactly the strategy implemented in the UK by British Gas in 2000. The company launched in autumn 2000 a comprehensive offer of telecom services: fixed telephony, mobile, Internet access. The objective is to duplicate the successful entry in the deregulated electricity market in 1998-1999 (3 millions customers in 2000) and British Gas aims to attract one million customers by the end of 2001. This offer is technically based on a set of strategic alliances with major providers: Vodafone for the mobile services, Torch Telecom (Kingston Communications) and Cable&Wireless for residential phone and Internet services. In this specific offer, the bundling takes the form of price reduction conditional to the subscription to other British Gas services: free minutes of voice communications every month for electricity

customers (which both stimulates the demand for telecom as well as electricity services), lower Internet rates and shorter minimum term contract for mobile customers (e.g. 3 months instead of 12) for fixed phone customer. But the company plans to experiment in the future wider bundles taking profit of its entire range of services.

5 Conclusion

This preliminary research allows us to define more precisely the questions and topics that require further analysis to understand better the potential for bundling in telecoms and Internet services. First of all, the differences between the relative failure of communications bundles in 2000 and the success of earlier experiences in mobile and Internet access services must be carefully examined. Is this the result of the poor economic and financial environment for telecom firms at that time? Or is there more fundamental issues at stake? One direction for research is certainly to examine the impact of bundling on production costs (effective potential for scale and scope economies) and consumers evaluation. On the second point, the role of the psychology of consumer judgment should not be underestimated and mental accounting principles could prove a fruitful approach (Johnson et al., 1999). Secondly, it would be interesting to model the mechanism of leveraging a large customer base (significantly captured through high switching costs). This actually proves, rather than the usual monopoly capacity to determine price and quantity, a central element in the entry strategy of utilities in the telecom markets.

Finally, these pervasive bundling strategies raise two significant and complex issues for regulators and policy makers: i) the juxtaposition of services typically offered by traditionally monopolistic, regulated industries with those offered by unregulated competitive companies, with the additional risk of mixing several sectorial regulations in package offer and firm activities (with utilities or banks selling telecom services), ii) the possible leverage of monopoly power in new emerging competitive markets (especially of information goods) by companies enjoying, or in position to reach soon, a monopoly in one segment of the telecom markets (incumbent phone providers in local telephony, backbone Internet providers, vertically integrated cable companies). In any case, this discussion illustrates how bundling will without doubt play a crucial role in the analysis of competition, entry and market structure in telecommunications and Internet-related industries.

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