THE ECONOMICS OF INTERNET FLAT RATES[*]

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(updated version)

Abstract

Some studies suggest that the European Union is lagging behind the United States in terms of Internet developments. The differences in pricing structures for Internet access may be one of the key factors that explain this disparity in Internet developments. Over the last two years, some Internet access providers have been experimenting unlimited Internet access services – "flat rates". However, most of these unmetered Internet access services have been withdrawn after just a short while. Some Internet access providers claim that the introduction of unmetered Internet wholesale services is needed to make "flat rates" commercially viable. In this paper, I aim to provide a simple economic analysis of Internet flat rates, both at the retail and wholesale levels. In particular, I suggest that wholesale unmetered interconnection does not necessarily encourage the development of flat rates, but may encourage innovative pricing.

Keywords: Internet access, Flat rate, Network economics.

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1. Introduction

Some studies suggest that the European Union (EU) is lagging behind the United States (US) in terms of Internet developments. For instance, OECD (2000) develops indicators to compare countries with regard to Internet development. The study shows that there are far less Internet hosts or secure servers in European countries than in the US.[1] It has been suggested that the differences in pricing structures for Internet access may be one of the key factors that explain this disparity in Internet developments. Indeed, while US consumers are charged for Internet calls on an unmetered basis through "flat rates", European Internet users are charged on a metered basis.[2] OECD (2000) considers that the "*price of access to the Internet, and the structure of this pricing, is one of the key factors in explaining the relative development of electronic commerce across the OECD area*" (p. 5). Regarding Germany, Welfens and Jungmittag (2000) expect that "*a switch to flat-rate pricing (...) will create a growth effect around a half-percent of the gross domestic product*".

Flat rates for Internet access –where consumers pay a fixed monthly fee for Internet use– are expected to increase the amount of time spent online. For example, it is often claimed that when AOL replaced metered charges by a flat rate in December 1996, the average time spent online doubled within three months.[3] Nielsen-NetRatings publishes data on Internet usage regularly which shows that there is indeed a gap between the US and the EU in terms of usage, even though it seems to be not that large.[4] Since they increase the time spent online, flat rates are also claimed to allow Internet users to try out Internet services and to encourage "always on" and real time activities on the Internet.

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[1] According to OECD (2000), in March 2000, there were 185 Internet hosts per 1,000 inhabitants in the US, compared with 41 per 1,000 in the United Kingdom and 16 per 1,000 for France. There were also six times as many secure servers on a per capita basis in the US than in the European Union. Updated OECD figures for 2001 confirm this gap.

[2] European consumers pay for local calls on a per-minute basis, while US consumers pay a fixed monthly fee for an unlimited amount of local calls. Other countries where unmetered Internet services are available include Australia, Canada, New Zealand and Mexico. Note however that in Australia, ISPs charge for Internet usage on a metered basis.

[3] Actually, AOL only followed Microsoft Network and small Internet service providers who started offering flat rates earlier (see, for example, "Flat-rate pricing changing Internet use patterns", Central Ohio Source, Dec. 19, 1996, http://centralohio.thesource.net/Files4/9612198.html).

[4] According to Nielsen-NetRatings, the time spent online per month in September 2000 was approximately 4:45 in the UK and 9:35 in the US. In December 2001, the time spent online per month was 9:20 in the US, while it was 6:46 in the UK and 7:25 in France in January 2002 (see: http://www.nielsen-netratings.com/). According to OECD (2000), US AOL users stay 27 hours online per month.

Over the last two years, a number of European Internet service providers (ISP) have announced their intention to introduce flat rates for Internet access. In 1999, Alta Vista UK announced that it was shortly going to launch a free unlimited Internet access service in the United Kingdom.[5] Other ISPs soon followed suit, namely NTL, Freeserve, Telewest and CallNet0800. In March 2000, World Online launched an unlimited Internet access service during off peak hours in France, and was joined two months later by OneTel with its 22.7 euros-a-month flat rate for unlimited Internet access.

The striking feature of these new unlimited Internet access services is that most of them disappeared from the market after just a short while. In July 2000, CallNet0800 announced that it had to stop offering unlimited Internet access because the business was not viable.[6] The following month, Alta Vista revealed that its promised service – for which 270,000 consumers had already signed up – never went live. The fiasco of offering but never launching an unmetered Internet access service forced Altavista UK's director to resign.[7] Six weeks after launching its unlimited Internet access service, WorldOnline also decided to pull of this market, and in November 2000, OneTel stopped selling its unlimited access service for definite.[8] When unlimited Internet access services are maintained, they are usually not really available to everyone, at all times. For example, Freeserve recently announced that it had stopped taking on new users for its unmetered package. It had in fact threatened to cut off heavy Internet earlier because of capacity problems.[9] In France, only AOL still proposes an unmetered access service, but the price (50 euros per month) is higher than the price for ADSL access. In addition, this unlimited access offer is not mentioned on AOL France's web site.

According to some ISPs and authors, unlimited Internet access services are not viable because of uneconomic interconnection conditions; in particular, ISPs lack a cost-effective unlimited Internet access wholesale service.[10] For instance, Welfens and Jungmittag (2000, p. 27) state

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[5] In March 2000, Alta Vista announced that in the end it would be rolling out its service before the end of June 2000.

[6] See: BBC NEWS, "ISP's new service never existed", Monday, 21 August, 2000, http://news.bbc.co.uk/hi/english/business/newsid_889000/889956.stm.

[7] See: BBC NEWS, "Altavista UK boss resigns", Monday, 4 September, 2000 http://news.bbc.co.uk/hi/english/in_depth/business/2000/internet_price_wars/.

[8] See: "OneTel renonce aussi à son forfait illimité", La Connexion Informatique, 30 octobre 2000, http://www.vnunet.fr.

[9] See: "Freeserve suspends registration for unmetered", http://news.zdnet.co.uk/story/0,,s2082117,00.html.

[10] For example, Andy Mitchell, managing director of Alta Vista UK, claimed that the main reason why unmetered Internet access services were not viable was that ISPs were "*reliant on the provision of flat rate*

that "*flat rate pricing at the retail level demands the introduction of similar models in the wholesale sector*". In May 2000, UK regulator Oftel satisfied this request by requiring BT to offer a wholesale unmetered interconnection service to network operators.[11] David Edmonds, Oftel's Director General of Telecommunications, stated that this decision provided "*a sound basis to promote competition in unmetered Internet access*" and that he expected "*to see more companies providing unmetered Internet access packages in the coming months*".[12] In November 2000, the German regulator (RegTP) required Deutsche Telekom to offer an unmetered Internet access wholesale service by February 2001.[13] This was the same date that France Télécom introduced a flat rate interconnection offer, following its discussions with the French regulatory authority (ART) and new entrants.[14]

The rationale behind the introduction of an unlimited Internet wholesale service is the following: with flat rates, interconnection costs increase with the amount of time that Internet users spend online, while Internet service providers earn no marginal revenues; therefore, a wholesale flat rate is required so that Internet service providers or IP network operators can pay for interconnection on an unmetered basis. However, due to flat rate pricing, networks may also experience a huge increase in connections in given periods of time. Since the extra capacity they would have to install would only be filled for a short period of time, metered interconnection could be more economic than unmetered interconnection.

In this paper, I aim to provide a simple economic analysis of Internet flat rates to explain why Internet service providers introduce them, why these offers may have failed, and to understand the conditions under which unmetered interconnection could encourage the development of flat rates for Internet users.

The rest of this paper is organised as follows. In Section 2, I provide a brief review of the industrial organization of the market for Internet access. In Section 3, I discuss the impact of

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circuits from BT" (See: "Alta Vista fails to deliver free Internet promise", August 22nd, 2000, http://www.totaltele.com).

[11] See: "Determination of a dispute between BT and MCI Worldcom concerning the provision of a Flat Rate Internet Access Call Origination product (FRIACO)", Oftel, http://www.oftel.gov.uk/competition/fria0500.htm.

[12] See: "Unmetered Internet access: Oftel moves to reassures consumers", *Press Release*, 22 août 2000, http://www.oftel.gov.uk/press/releases/2000/pr63_00.htm.

[13] "Deutsche Telekom AG must offer wholesale flatrate product as from 1 February 2001", Press Release, RegTP, Bonn, 16 November 2000.

[14] See: "Flat rate interconnection for Internet traffic: ART takes a position", *Press Release*, http://www.art-telecom.fr/communiques/pressrelease/index-13-2001.htm.

flat rates on Internet usage. In Section 4, I analyse the likely impact of retail flat rates and wholesale flat rates on the competitive environment. In Section 5, I conclude this paper.

2. The market for Internet access

In this section, I provide an overview of the Internet access market. I first describe the demand side of this market and then look at the supply side. Finally, I explain the pricing strategies observed in the wholesale and retail markets.

Demand

Internet access is a fast growing market. In August 2001, around 513 millions people were online according to NUA Internet Surveys.[15] As table 1 below shows, Internet penetration varies substantially across countries, and is the highest in the US and Nordic Europe. However, it should be noted that these figures must be analysed with a certain amount of caution, since they are not necessarily coherent.

Country	**People online** (millions)	**Percentage of population online**	**Source**
United States	166.1	59.7%	NielsenNetRatings[16], Aug. 2001
Norway	2.4	54.4%	NielsenNetRatings, Aug. 2001
Sweden	5.6	63.5%	NielsenNetRatings, Aug. 2001
United Kingdom	33.0	55.3%	Jupiter MMXI[17], Jun. 2001
Germany	28.6	34.5%	NielsenNetRatings, Aug. 2001
France	11.7	19.6%	SESSI[18], Aug. 2001

Table 1: Online penetration in selected countries in 2001

[15] See: http://www.nua.ie/surveys/how_many_online/.

[16] See: http://www.nielsennetratings.com/.

[17] See: http://uk.jupitermmxi.com/xp/uk/home.xml.

[18] See: http://www.evariste.org/sessi/.

Demand for Internet access is heterogeneous with regard to both consumption behaviour (low users vs. high users) and technological aptitude ("newbies" vs. "veterans"). Moreover, some switching costs are incurred when leaving a given Internet service provider (ISP). For example, a given user's e-mail address or web site is no longer active if he leaves his current provider. However, Internet users may subscribe to more than one ISP if these players only charge usage fees (for instance, users may subscribe to more than one "free" ISP for no cost at all).[19] It is also possible to get an ISP-independent e-mail address from some portals (e.g., hotmail.com).

Supply

When a consumer accesses the Internet, three types of firms are involved (see also figure 1 below):

- *Its local loop operator.* In most cases, the Internet user subscribes to the incumbent's local loop. However, in the near future, some consumers will be able to access the Internet through alternative local loops. Firstly, alternative infrastructures, like cable networks or UMTS networks, are developing, and secondly, the unbundling of the local loop enables new entrants to lease access lines to the incumbent to offer local loop services. In January 2001, the European Commission put into force its decision on mandating local loop unbundling in all the E.U. member countries. That decision (EC/2887/2000) requires the incumbent operators to provide access to their copper lines.

- *A transport operator.* It is interconnected with the local loop operator at a Point of Interconnection (POI). It collects traffic from Internet users, and then conveys and delivers it to the Internet service provider. Typically, transport operators are long distance network operators. Indeed, in most, if not all countries, ISPs do not have access to the incumbent's Reference Interconnection Offer.

- *An Internet service provider.* The ISP is interconnected with the transport operator. It provides connectivity to the Internet.

[19] For example, in May 2001, 19% of british residential consumers used more than one ISP (see: "Oftel's 2000/01 effective competition review of dial-up Internet access", Oftel, 30 July 2001, http://www.oftel.gov.uk/publications/internet/imr0701.htm).

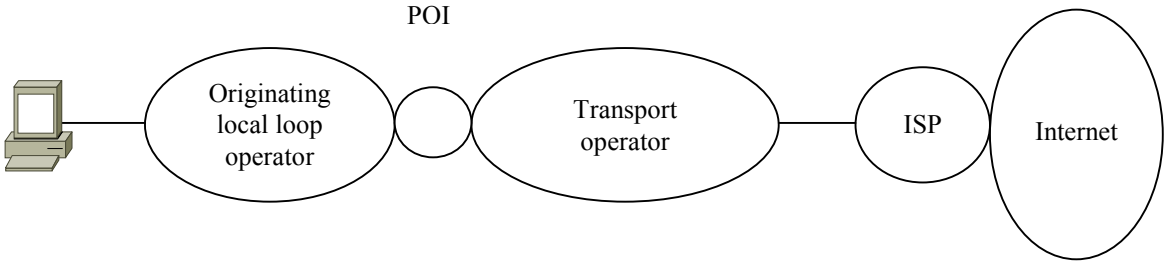

Figure 1: The market for Internet access

Market structures

In most countries, the local market is still controlled by the incumbent operator due to high entry costs.[20] However, on account of its dominant position, the incumbent is regulated.

The IP transmission market is an oligopoly. A few national Internet backbones (for instance, in France, companies like France Télécom, MFS and Colt) are competing to collect and convey traffic. Barriers to entry take the form of both entry costs and regulatory barriers (e.g., holding a licence).

At first sight, the ISP market seems to be highly competitive. For instance, in the UK, there are more than 400 ISPs, 250 of which are subscription-free ISPs. Moreover, regulatory barriers to entry are relatively low.[21] However, this market is in the hands of just a few players: according to OFTEL (2002), the three largest ISPs in the UK (Freeserve, AOL and BT Internet) were used by 44% of home Internet users in November 2001. In France, 63% of the market is served by the four largest ISPs, namely Wanadoo, Free, Liberty Surf-Tiscali and AOL France. Market concentration probably derives from large economies of scale and the existence of switching costs for customers. Indeed, large ISPs have a cost advantage: since they have a larger customer base, they are able to get lower prices from transport operators than small ISPs.

Finally, some Internet service providers are vertically integrated either with telecommunications operators or content providers. For instance, three of the four largest ISPs

[20] A notable exception is the UK where in 1999 cable network and wireless local loop operators earned about 12% of total local loop revenues (source: Oftel Market Information, June 2000). However, according to Oftel (2001, §S.3), "*99 per cent of residential consumers who access the Internet do so via PSTN dial-up*".

[21] For example, in France, ISPs belong to L.34-2 article of the French 1996 Telecommunications Act. They do not need to apply for a licence.

in France are vertically integrated with telecommunications operators.[22] Moreover, some national Internet backbones are vertically integrated with European or international backbones.

Internet access pricing mechanisms

There are currently two technologies to access the Internet on raw copper local loops: dial up and DSL.[23] With dial-up Internet access, the local loop operator collects traffic from Internet users through local switches. The transport operator receives traffic at its point of interconnection. Internet circuit-switched traffic is translated to IP data traffic through a Network Access Server (NAS). In most cases, the NAS belongs to the ISP. With DSL Internet access, local loop operators collect data traffic from Internet users through digital subscriber line access multiplexers (DSLAM). The transport operator receives IP traffic at a POI.

Dial up access pricing

Incumbents are required to offer Internet interconnection services in most European countries on account of their dominant position. Two main interconnection models are available for Internet access. With direct interconnection, the incumbent operator charges Internet users as much as the local rates and transfers a proportion of the revenue to the terminating operator. The ISP may charge users for Internet connectivity. This interconnection model leaves no room for flat rate pricing since, in Europe, local calls are currently charged on a metered basis.

Direct interconnection has given rise to the two first pricing models for Internet users. The first model involved the customer paying its local operator for local Internet calls and a subscription to its ISP. The move towards the second model –the "free model"– began in the UK in 1998 with electronics retail Dixons' service, Freeserve. The success of Freeserve led to an explosion of free ISPs, first in the UK and later across Europe. In November 2001, Freeserve enjoyed a 32% share of the ISP market with 1.9 million active subscribers. There

[22] Wanadoo is a subsidiary of France Télécom. The Libertysurf Group controls both Liberty Surf and a network operator, AXS Telecom. Lastly, Free controls 100% of Linx, which holds an L.33-1 network operator licence. In March 2001, Vivendi Universal announced that Cegetel and Canal Plus would exchange their 55 percent share in AOL France for junior preferred shares in AOL Europe.

[23] DSL stands for "Digital Subscriber Line".

are currently over 250 free ISPs in the UK.[24] Free ISPs also operate in France, Spain, Denmark and Ireland.

Following the development of "free" Internet access, some ISPs have introduced fixed monthly fees which allow users to access the Internet for a given number of hours. France Télécom was the first to introduce these packages in France, and other ISPs soon followed suit. Unlimited Internet access services –Internet flat rates– have also been introduced in some countries. These new pricing models have been made possible by indirect interconnection services. With indirect interconnection, transport operators pay Internet interconnection rates to the incumbent, while ISPs collect revenues from users. Contrary to direct interconnection, indirect interconnection provides ISPs with the ability to charge Internet users for both calls and Internet connectivity.

In most countries, Internet interconnection services are charged on a metered basis.[25] Some national regulators are considering the idea of making incumbent operators introduce wholesale flat rates. Unmetered Internet interconnection was first introduced in the UK. In May 2000, following a dispute between MCI Worldcom and BT, Oftel required BT to offer a wholesale flat rate service, "FRIACO",[26] at the local exchange level by June 1st, 2000.[27] The rationale behind Oftel's decision was that the lack of an unmetered Internet access wholesale product could distort or restrict competition.[28] In February 2001, Oftel further requested BT to provide a single tandem wholesale flat rate Internet access service.[29]

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[24] See OFTEL (1999).

[25] See: ARCOME (2000) for an in-depth description of Internet interconnection in Europe.

[26] FRIACO stands for "Flat Rate Internet Access Call Origination".

[27] See: Oftel (2000b).

[28] In December 1999, BT announced it would launch Internet flat rate products –under the name "Surftime" –in 2000. The first version of Surftime –"Surftime I"– bundled two segments of Internet access: origination and IP transmission. Oftel together with network operators complained to the fact that "Surftime I" gave no room for IP network operators to compete with BT on the IP transmission segment. Mid-February, BT announced a revised version of Surftime –"Surftime II". This new version of Surftime provided customers with only the origination segment. IP network operators were allowed to interconnect with BT to provide IP transmission. In September 1999, MCI Worldcom requested BT to offer an interconnection product (FRIACO). In December 1999, after BT's refusal, MCI Worldcom referred the dispute to Oftel. In May 2000, Oftel published its Direction, which required BT to offer FRIACO to IP operators.

[29] See Oftel (2001).

DSL access pricing

As for DSL Internet access, the availability of wholesale services differs across countries. First, in places such as France, the incumbent resells its own DSL access service with a discount. An ISP can buy the incumbent's service and resell it under its own brand name.[30] The second type of wholesale DSL service, known as "Bitstream Access" or "Permanent Virtual Circuit" enables service providers and operators to access customers over the incumbent's upgraded network; DSLAM equipments are owned by the incumbent. Lastly, the unbundling of the local loop enables network operators to lease copper lines from the incumbent for a fixed monthly fee and to install their own equipment in its premises. Contrary to dial up Internet access, all rates for DSL wholesale services are unmetered.

3. Internet usage

Internet services

"Internet" is not a service in itself. Rather, Internet provides access to a wide range of Internet-based services: e-mail, file transfer, online news, online games, peer-to-peer services, web browsing, etc. To explore the impact of various rate structures on Internet usage, I try to estimate a very simple utility function for each type of Internet service. The drawback with this approach is that it might not be possible to define an aggregate utility function for Internet access. However, my aim here is to establish that the impact of the Internet access rate structure on Internet usage depends on the type of Internet-based service considered. Therefore, it seems appropriate to look at different uses separately.

For an Internet-based service, the typical utility function will have the following form:

$$U = U(t, b, n)$$

where t is the time spent at using the Internet service, b is the available bandwidth, and n the number of users. This utility function specifies:

- *How utility varies with respect to the amount of time spent using the service:* utility certainly increases with time for Internet services like instant messaging or online radio; however, for services like file transfer (FTP), the longer it takes to download a file, the

[30] For instance, in France, Mangoosta, a new entrant which provides DSL access, uses resale to commercialise its own products.

lower the utility; for e-mail, the analysis is more difficult: on the one hand, the longer it takes to download new messages, the lower the utility; on the other hand, users benefit from staying online longer to receive new messages on a continuous basis.

- *How utility varies with respect to the number of Internet-based service users online:* some services, like peer-to-peer services (e.g., Napster or Gnutella) or online games, exhibit strong positive network externalities, which means that for a given user, utility increases with the number of other users online. Other services (like streaming services) involve no positive network externality.

- *How utility varies with respect to bandwidth:* the impact of the available bandwidth on utility also vary across Internet-based services. Firstly, larger bandwidth has a direct positive quality effect: Internet users get access to a wider range of Internet services (a variety effect) or quality improves (e.g., for audio or video services or online radio). An increase in bandwidth may also have an indirect positive quality effect: for instance, it takes less time to download files as bandwidth increases, which indirectly increases utility.

For example, the utility function for online games seems to satisfy the following properties: $\partial U/\partial t > 0$, $\partial U/\partial n > 0$, $\partial U/\partial b > 0$. By comparison, the utility function for file transfer satisfies different properties: $\partial U/\partial t < 0$, $\partial U/\partial n = 0$, $\partial U/\partial b > 0$.

The following table synthesizes this analysis and proposes a tentative analysis of the utility function for various Internet-based services.

Service	***Utility increases (+) or decreases (-) with…***			
	Time	**Number of users online**	**Bandwidth**	
			Direct effect	*Indirect effect*
E-mail	?		+	+
Instant messaging	++	+	+	
Chat, online games	+	+	+	
P2P (Napster/Gnutella)	+	+	+	+
Online radio	++		+	
Streaming	+		+	
File transfer, web browsing	-		+	+

Table 2: Properties of utility function for various Internet services

From the analysis above, it follows that there is also a strong relationship between the usage profile of Internet users and the Internet access rate structure. Firstly, the impact of a switch to flat rate Internet access on Internet usage depends on the distribution of Internet-based services currently used by consumers. Secondly, the introduction of flat rate Internet access will definitely have an impact on the structure of Internet usage. I now will focus on the first effect.

Two possible effects have been ignored in the above analysis. Firstly, if capacity constraints are binding, the number of users may have a negative impact on the quality of service. This means that for some services there is a balance between positive and negative network externalities. Secondly, at this stage, the analysis does not take into account the opportunity costs of being online for Internet users. Opportunity costs include opportunity costs of time, and for users with a single phone line, opportunity costs of tying up this line. I introduce these "usage costs" in the analysis below.

The impact of flat rates on Internet usage[31]

Since each Internet-based service has its own characteristics and rules, a switch to flat rate pricing will impact Internet-based services in different ways. For the purpose of analysis, assume that each Internet user only uses one Internet service. He derives no utility ($U = 0$) if he chooses not to access the Internet and utility U if he chooses to access. The Internet user maximises his utility with respect to a connection choice, c ($c = 1$ if he connects, $c = 0$ otherwise), and time spent online using the service, t, net of the price charged for Internet access, p, plus usage costs, $v(t)$:

$$\max_{c,t} \{ U(t,n,b) - (p + v(t)) \}$$

The total price paid by the consumer is $p = p_0 \cdot t$ if the ISP charges consumers on a metered basis, and $p = p_1$ under a flat rate (p_1 does not depend on t). The analysis below suggests that a switch to flat rate pricing will impact time spent online in different ways depending on the type of Internet-based service considered.

[31] In the analysis, I will ignore issues related to priority of information. Indeed, following MacKie-Mason and Varian (1995), economists have suggested that appropriate pricing schemes might solve congestion problems, by allocating bandwidth according to the users' valuations of congestion. This literature will be briefly discussed in the conclusion.

Direct positive effect on the time spent online

First, consider Internet services like file transfer. The marginal utility with respect to time is always negative, whatever the tariff structure (i.e., $\partial U/\partial t < 0$). Indeed, users would actually like file transfer to be immediate (i.e., $t = 0$); in that case, time spent online depends on the size of the file and the available bandwidth, i.e. the minimum time needed to download the file. A switch to flat rate has therefore a limited impact on that type of usage. However, note that thanks to the flat rate, users may download larger files or more files without incurring extra costs.

Second, consider services like online games or audio/video streaming. It seems reasonable to assume that utility increases with time up to a saturation point, above which marginal utility turns negative. A switch to flat rate increases time spent online up to that point, since $\partial U/\partial t - p_0 - v'(t) < \partial U/\partial t - v'(t)$.

Third, consider services like instant messaging or online radio. Here, it can be assumed that utility increases with time. Therefore, users will stay online up to an upper ceiling, such that $\partial U/\partial t = v'(t)$. If marginal usage costs are low compared to marginal utility, this equation might not have a solution. In this case, a switch to flat rate pricing leads to "always on" behaviours: users stay online all the time.

Indirect negative effect on the time spent online

The introduction of flat rates may also have a negative indirect effect on the time spent online. Indeed, if flat rates create congestion problems, the available bandwidth for each user may be reduced. Since time spent online increases as bandwidth becomes larger, capacity problems may indirectly lead to a decrease in the time spent online. However, some unmetered Internet access providers – like RedHotAnt in the UK – have observed that congestion problems may encourage users to stay online longer: once they get online, users stay online for fear of not being able to get on again later.

Whether the direct positive effect dominates the negative indirect effect depends on various factors, among which the ability of ISPs and transport operators to cope with congestion problems.

The impact of flat rates on the number of simultaneous connections.

Services like instant messaging or online multi-player games exhibit strong network externalities (i.e., $\partial U/\partial n > 0$). Flat rates may stimulate the demand for these services. First, a switch to a flat rate scheme allows Internet users to increase the time spent using these services. This, in turn, makes it more appealing to participate in network activities.

Network externalities may lead to an increase in the number of simultaneous connections. For example, on March 1, 2000, WorldOnline launched an Internet access service in France with unlimited access during off peak hours for USD 27.35 per month. It appeared that 65% of subscribers tried to connect a few minutes after the beginning of the off peak period, at 7 pm. A high number of simultaneous connections may subsequently increase the peak load for the networks involved in the Internet access service.

The following table summarizes this analysis. For simplicity, I ignore the indirect negative effect of flat rates on the amount of time spent online. If included, this effect would limit the increase in the time spent online.

Service	***Flat rates tend to increase…***	
	Time spent online	**Number of simultaneous connections**
E-mail	?	No
Instant messaging	Yes	Yes
Chat, online games	Yes	Yes
P2P (Napster/Gnutella)	Yes	Yes
Online radio	Yes	No
Streaming	Yes	No
File transfer	No	Yes

Table 3: The effect of flat rates on Internet-based services usage

This analysis suggests that a switch to flat rate pricing has two major effects. First, it encourages "always-on" connections to the Internet (for services like instant messaging or online radio). Second, it increases the number of simultaneous connections in given periods of time for services which exhibit strong network externalities.

4. The impact of flat rates on the market for Internet access

Internet service providers have either launched or announced they are going to launch retail flat rates for Internet access in most European countries. In this section, I aim to discuss the impact that flat rate pricing could have on the competitive environment. I first concentrate on the impact of retail flat rates and then turn to wholesale flat rates and the relationship between retail and wholesale flat rates.[32]

4.1. The impact of retail flat rates

Internet service providers have both incentives and disincentives to introduce flat rates. I discuss first the first group and then look at the latter. Finally, I turn to quality issues.

Increasing revenues from e-commerce and advertising

The introduction of Internet flat rates may increase the amount of time spent online, and incidentally e-commerce revenues. Jupiter Research estimates that in 2000 only 11% of "newbies" (who have been on the Internet for less than a year) have purchased something online, compared with 41% of "veterans" (who have been on the Internet for more than two years).[33] Since Internet experience increases with time spent online, Internet flat rates may stimulate the growth of e-commerce revenues.[34]

Will ISPs benefit from this growth of e-commerce revenues? Typically, the question is: will Internet users spend more time on the ISPs' own portals? The answer depends on the costs incurred by users when switching to a different e-commerce web site. If switching costs are low, ISPs will not *directly* benefit from the increase of e-commerce revenues. Low switching costs are associated with an "open" service – like most ISPs provide – while high switching costs may exist in a "walled garden" model of the Internet.

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[32] In the United States, the situation is quite different from the one observed in Europe. Historically, local operators used to charge customers a flat rate for local services. Flat rate pricing for Internet access was first introduced by new ISPs for various reasons including: fierce competition, technical difficulties of introducing metering in the TCP/IP environment, etc. These first-movers were soon followed by the incumbent online services providers like CompuServe, or AOL.

[33] See: http://www.emarketer.com/estatnews/estats/eeurope/20001116_europe.html.

[34] Jupiter Research predicts that the proportion of "veterans" will grow from 27% in 2000 to 74% in 2005.

ISPs may also benefit *indirectly* from the growth of e-commerce revenues through advertising. Indeed, a proportion of e-commerce revenues are transferred to the sites that send potential customers to e-commerce sites (either through advertising or partnership). IPSs' portals with a large Internet audience may therefore earn increasing revenues from advertising or partnership.

Extracting more surplus from customers and locking them in

Flat rate pricing provides users and service providers with known expectations for payments. However, users have often only imperfect information ex ante about their usage behaviour (e.g., how long they will stay online each month). Therefore, some customers may subscribe to a flat rate scheme, even though it could be less costly for them to subscribe to other pricing schemes (e.g., a per-minute pricing scheme).[35]

ISPs may also view flat rates as a means of locking in Internet users. Firstly, once a consumer has subscribed to a flat rate, he has no incentive to subscribe to another Internet service provider, since the marginal cost of accessing the Internet is zero. Internet users with flat rates should therefore have a single ISP (while free ISPs' customers tend to have more than one Internet service provider). Secondly, customers may be required to subscribe to a flat rate for a given time period (e.g., a year). Such constraints increase customers' switching costs. Flat rates may therefore reduce the Internet churn rate.[36]

Profit incentives

Competition between ISPs has led to a decrease in prices for Internet access for all users. The introduction of Internet flat rates may be viewed as a step toward lower prices for large Internet users. From an economic point of view, low prices ex ante (i.e., prices below costs) may be rational if customers have switching costs: firms compete ex ante to attract customers and are able to raise prices ex post, once they have a customer base. Besides, flat rates may attract new customers to the market.

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[35] This phenomenon has also been observed in the mobile telephony industry.

[36] In 1999, The Strategis Group estimated the Internet churn rate in Europe around 25% (see: "European Internet Churn Rate At 25% Reports The Strategis Group", Press Release, December 16th, 1999, http://www.strategisgroup.com/press/pubs/eiut99.htm). In a survey made by Oftel, 46% of Internet home users said they had changed their ISP at least once (see Oftel, 2002).

Flat rates for Internet access may also be seen as a competitive reaction to broadband service providers. Indeed, dial up ISPs compete with broadband providers (either cable- or ADSL-based) which offer flat rates for unlimited broadband Internet access. The tariff structure adopted for broadband access services represents a quality advantage for early entrants in the broadband access market.[37] Therefore, dial up Internet service providers may simply follow or anticipate broadband Internet service providers in charging flat rates for Internet access.

Encouraging consumers to learn by using and switch to broadband access

As they stay longer online, users become aware of the content and services available on the Internet. Once they have explored the Internet and assessed the utility they can derive from it, they may decide to switch to broadband Internet access. Hence, flat rates may help users to experiment with Internet-based services at a reasonable cost.

Since Internet service providers will certainly all offer both broadband and dial up Internet access to Internet customers, offering Internet flat rates may be an adequate strategy for an ISP to make consumers "learn by using" and eventually switch to a broadband service. This strategy is rational if the Internet user leases a broadband connection from the same Internet provider, and this could be the case if switching costs are sufficiently high.

Cannibalisation

Some Internet service providers' competitive or profit incentives to introduce flat rates may be weakened by the fear of cannibalising their existing access services. For instance, service providers which offer both dial up and broadband Internet access may be reluctant to introduce flat rates for dial up access out of fear of cannibalising their broadband services.

Leading ISPs may also be reluctant to introduce flat rates if it decreases the revenues they earn from large Internet users. It should be noted that in France and in the UK, flat rates were first introduced by followers rather than Internet access leaders.

[37] For example, this is the case in France for France Telecom's ADSL service, "Netissimo". In November 2000, on Netissimo's Web site (http://www.netissimo.tm.fr/), it was clearly indicated that Netissimo involved no metered charges ("*Grâce à Netissimo associé au service d'accès Internet de votre choix, vous naviguez sur le Net affranchi des communications locales*"). The fact that you may access Internet faster with ADSL was not mentioned!

Quality issues

Internet flat rates may create network congestion problems. On the one hand, if ISPs try to solve these problems, they will have to invest in network capacity. However, investing in dial-up network technologies today may be viewed as risky, if one considers that broadband Internet access will replace narrowband Internet access in the coming years.

One the other hand, if ISPs do not solve congestion problems, the quality of service decreases. The service provider may lose its reputation as a high quality provider and this may lead customers to switch to other ISPs identified as "high quality" service providers.

Furthermore, flat rate pricing *per se* gives ISPs low incentives to provide customers with bandwidth, compared to metered charging schemes. Indeed, first consider an ISP which charges its customers the local rate: if bandwidth costs are ignored, the larger the bandwidth, the longer users stay online and the larger the revenues. Now, consider that the ISP charges its customers a flat rate. If reputation issues are ignored, the ISP has no incentive to provide quality, since its revenues are fixed. In other words, with metered charges, ISPs have both traffic and reputation incentives to provide quality, while with unmetered charges, ISPs have only reputation incentives.

4.2. The impact of wholesale flat rates

In this section, I focus on the effect that wholesale flat rates may have on retail flat rates and on the incentives for introducing innovative pricing schemes. Wholesale flat rates may have additional effects. For instance, some incumbent operators claim that flat rate interconnection raises strong quality issues and may deteriorate not only the quality of Internet access services but also the quality of telephone services. The introduction of wholesale flat rates may also have an impact on the industrial organization of the backbone market. These effects are not covered in this section.

Wholesale flat rates are not necessarily favourable to retail flat rates

It has been suggested that wholesale flat rates always encourage the introduction of retail flat rates. I would like to suggest that it may not necessarily be the case. For example, it might not be true if retail flat rates considerably increase the number of simultaneous connections in a given period of time.

To understand why, assume that an ISP introduces a flat rate for Internet access. Assume this ISP (or, more exactly, its transport operator) can choose between two interconnection pricing schemes: an unmetered (flat rate) interconnection scheme with price per circuit p_K and a per-minute pricing scheme, with price per minute $p_{\min}$. The transport operator minimises its interconnection costs.

To simplify, assume there are two periods of time : "day" and "night". Then, let us assume that there are two Internet-based services: an "always-on" service (e.g., instant messaging) and a "community" service (e.g., online games). Users of the "always-on" service are always connected to the Internet (e.g., to receive instant messages), day and night. Users of the "community" service connect massively to the Internet during a given period of time, say at night. For instance, online gamers often connect to the Internet at specified hours to play multi-player games.[38] Assume that there are k_1 "always-on" users and k_2 "community" users. The network operator must therefore install a capacity equal to $k_1 + k_2$ to avoid congestion (see figure 2 below).

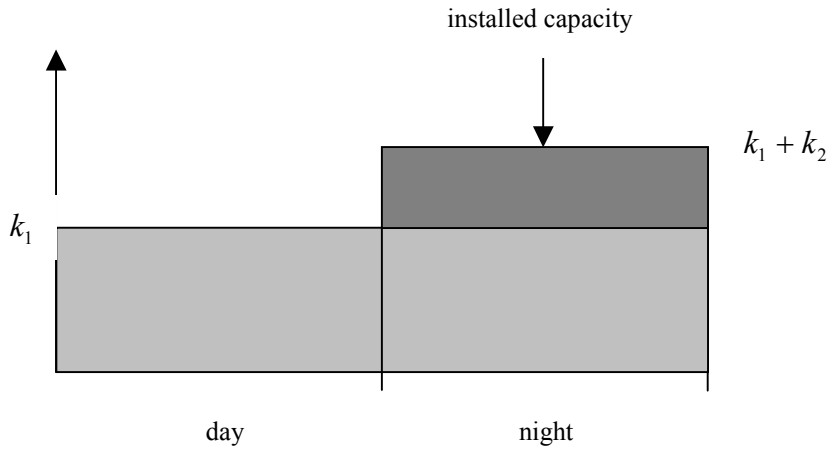

Figure 2: network capacity with always-on and community users

In this framework, the transport operator will choose the flat rate interconnection scheme only if it uses its capacity more efficiently than the incumbent does. If the incumbent's load curve is flatter than the transport operator's, the transport operator will choose the per-minute pricing scheme (see also box below for a development).

[38] For example, Goa, France Telecom's online platform, organises "Quake nights" which start at specified hours, e.g. 20:00 (see: www.goa.com).

For example, assume "day" lasts twenty hours and "night" four hours. The transport operator chooses flat rate interconnection if and only if:

$$p_K \leq \frac{24 \times 60 \times k_1 + 4 \times 60 \times k_2}{k_1 + k_2} \cdot p_{\min}$$

Let k_1^I and k_2^I be the capacity used in the incumbent's network, respectively during "day" and "night". p_K is related to $p_{\min}$ through the following formula:

$$p_K = \frac{4 \times 60 \times k_1^I + 4 \times 60 \times k_2^I}{k_1^I + k_2^I} \cdot p_{\min}$$

Let $\alpha \equiv k_1 / (k_1 + k_2)$ and $\alpha^I \equiv k_1^I / (k_1^I + k_2^I)$. It is easy to see that the transport operator chooses flat rate interconnection if and only if $\alpha \geq \alpha^I$, i.e., if its load curve if flatter than the incumbent's.

Wholesale flat rates may encourage innovative pricing

Flat rate pricing at the wholesale level provides transport operators or ISPs with more flexibility in terms of retail pricing. Indeed, as Cave and Crowther (1999, p. 17, §3.28) explain: "*If [capacity charging] were adopted, it would then be in the interests of an operator which had bought capacity to seek to fill it in ways which maximise its revenues using whatever retail tariffing methods it found appropriate*". Therefore, flat rates at the wholesale level may provide IP network operators and ISPs with strong incentives to introduce innovative pricing schemes.

5. Concluding remarks

In this article, I discussed the impact of introducing flat rates in Europe on the competitive environment. In the first part of the paper, I explored the impact of flat rates on Internet usage. This analysis shows that flat rate pricing has two major effects. First, it tends to increase the time spent online and encourages "always-on" connections to the Internet. Second, flat rate pricing tends to increase the number of simultaneous connections at specific periods of time. In the second part, I used this analysis to show that the introduction of wholesale flat rates is

not a necessary condition for the development of retail flat rates. For the ISP (or its transport operator), flat rate interconnection only proves less costly than metered interconnection if it is able to fill capacity more efficiently than the incumbent. Lastly, I have also analyzed the incentives to introduce (or not to introduce) flat rates, and finally, have shown that flat rates may create quality issues, due either to congestion issues or low incentives to provide quality.

My analysis is coherent with what we can observe in the Internet access market today. On the one hand, the introduction of a wholesale flat rate in the UK – "FRIACO" – has been followed by the introduction of retail flat rates, since 28% of home users had fully unmetered Internet access at home in November 2001.[39] But on the other hand, while a wholesale flat rate is also available in France, leading ISPs (including, Free, Tiscali-Liberty Surf, Club Internet and AOL) announced in December 2001 that they did not plan to launch retail flat rates.[40]

From a policy point of view, flat rates would probably contribute to increase the time some Internet users spend online. However, it is beyond the scope of this paper to determine whether dial-up flat rates could encourage the development of Internet usage in European countries. To begin with, this paper focuses on dial-up Internet and ignores broadband Internet access, which will probably develop rapidly in the coming years. Added to this, Internet access pricing structures may not be the main factor which influences Internet developments. Other factors might also have a strong influence: the competitive environment, the cost of Internet devices, etc. For instance, Bauer, Berne and Maitland (2001) develop a statistical analysis that shows that while price level or regulatory variables have a strong influence on the national diffusion of the Internet, price structure does not.

Finally, as McKnight and Boroumand (2000) suggest, a relevant question is now: what next? Following MacKie-Mason and Varian (1995), economists have suggested that flat rate pricing is an inadequate pricing scheme, once there is congestion problems. The idea is that flat rates do not take into account the users' valuation of congestion. One way to solve network congestion is to over-provide bandwidth. If it is too costly to do so, appropriate pricing schemes might be introduced to allocate bandwidth between users in a more efficient way.

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[39] For instance, Freeserve proposes unlimited Internet access for £12.99 a month ("FreeAnyTime"). However, in the terms of use, Freeserve reserves the right to disconnect users "*after 2 hours continuous use and/or 10 minutes of inactivity during connection*" (see: https://join.freeserve.com/anytime/tou.ahtml).

[40] See: "Forfaits illimités : pas d'offres à l'horizon", http://www.01net.com/rdn?oid=169257&rub=2148.

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