

REGULATING FOR NON-PRICE DISCRIMINATION The case of UK Fixed Telecoms

Martin Cave; Lisa Correa & Pietro Crocioni¹

*Draft
(22 August 06)*

1. INTRODUCTION

Telecoms regulators have increasingly signalled concerns about the incentives and ability of vertically integrated incumbents to engage in discriminatory behaviour against competitors in downstream markets. This concern is particularly strong in fixed telecoms where incumbents have substantial market power. In other regulated sectors, vertical or structural separation has often been adopted to eliminate any incentive to engage in such behaviour. However, while vertical or structural separation in fixed telecoms may remove concerns about discrimination, it can give rise to other problems. Consequently, regulators or competition authorities have so far generally refrained from it.

The UK Office of Communications (Ofcom) has recently accepted undertakings from British Telecom (BT), the vertically integrated provider of fixed telecoms services in the UK. These constitute one of the latest attempts to address discriminatory concerns in fixed telecoms. Their aim is to tackle this concern by functionally rather than structurally separating the divisions of BT that provide upstream services.

Previous research in this area has either looked at the theoretical incentives of vertically integrated operators to engage in discriminatory behaviour or considered the theoretical merits of various regulatory measures to improve competition. This paper contributes to the literature in this area by joining these two strands of analysis, examining the incentives of vertically integrated operators with market power to discriminate using where possible empirical evidence relevant to the UK and considering possible regulatory responses to this behaviour. Further, given that competition authorities assess price discrimination using a *rule of reason* approach rather than a *per se*, ban, it discusses how in a regulated industry non-price discrimination could be treated differently from price discrimination. Finally, it briefly describes the remedy adopted by Ofcom to deal with this issue.

The structure of the paper is as follows:

- Section 2 briefly describes the nature of the problem identified by Ofcom;
- Section 3 presents a review of the literature on the incentives to discriminate;
- While Ofcom only briefly discussed why BT had an incentive to engage in non-price discrimination, Section 4 provides some evidence on whether the factors that provide and strengthen these incentives existed;

¹ M Cave, Warwick Business School; L. Correa, and P. Crocioni, Senior Economists, Chief Economist Team, Ofcom. We wish to thank Tommaso Valletti for his insightful comments and suggestions, Pedro Pereira, Peter Culham and Alex Blowers for their discussions and support. In addition, we wish to thank Frances Haque and Darren Waterman for their assistance on the empirical analysis. The authors have all worked for Ofcom on this issue. The paper thus presents perspective and commentary on the economic issues from the viewpoint of the economists who were active in the case. However, the content of this article reflects only the opinion of the authors, who are solely responsible for any remaining errors.

- Finally, Section 5 discusses why non-price discrimination could be treated differently from price discrimination and provides reasons why a *per se* ban may be justified. Having established that “traditional” *ex post* and *ex ante* remedies are unlikely to be effective, it then briefly considers alternative regulatory responses to this behaviour and describes the solution favoured and adopted by Ofcom.

While the focus is mainly on UK fixed telecoms, the discussion should be relevant to all countries with vertically integrated operators.

2. THE NATURE OF THE PROBLEM

In December 2003 soon after Ofcom was created (from the merger of five different regulatory agencies dealing with communications services), it launched the Strategic Review of Telecommunications (Ofcom, 2004). Its aim was to assess whether the then current regulatory approach was still appropriate.

The main conclusion from this review was that BT had an incentive and the ability to engage in discriminatory behaviour which could prevent, restrict or distort competition in a number of markets – see Sections 3 and 4. Ofcom also provided evidence of such behaviour (Ofcom, 2005). The incentive arose from:

- BT’s market power in the provision of fixed infrastructure or network services which was constrained by the imposition of cost based access; and
- BT’s vertical integration into the downstream markets for which that infrastructure is a critical input.

Ofcom believed that its current powers were insufficient to deal with the problem. Consequently, it put forward a proposal to introduce a form of functional separation and strengthen the current non-discrimination rules (See Section 5). These measures were later adopted and implemented (Ofcom, 2005).

3. THE INCENTIVE TO ENGAGE IN DISCRIMINATION

The Chicago School argues that, when the downstream market is (perfectly) competitive and inputs are used in fixed proportions, a vertically integrated incumbent does not have an incentive to leverage its market power downstream, putting its downstream rivals at a disadvantage, unless they are less efficient.² More recent work shows, however, that there are exceptions to this conclusion. Of particular interest here is a particular form of discrimination that occurs in a regulatory context and is often described as “sabotage”.

In most upstream telecommunications markets incumbents are subject to a number of obligations, including a prohibition to engage in price and non-price discrimination

² The Chicago School suggests that when the downstream market is perfectly competitive the incentive to behave anti-competitively and leverage upstream market power disappears. This is because under the theoretical assumption of perfect downstream competition there are no supra normal profits or rents that are worth capturing. Conversely, under the assumption of fixed proportions, the vertically integrated firm could extract all profits by charging the monopoly price for the upstream input.

via general *ex ante* non discrimination obligations. However, enforcement on non-price discrimination is inherently difficult - see Bernheim and Willig (1996). In light of this, considerable academic literature has focused on the ability and incentives of a vertically integrated operator to engage in non-price discrimination - e.g. Economides (1998a, b), Sibley and Weisman (1998a, b), Mandy (2000), Weisman and Kang (2001), Reiffen and Ward (2002), Beard, Kaserman and Mayo (2001), Bustos and Galetovic (2003) and Sand (2003). By putting downstream rivals at a disadvantage a vertically integrated operator is able to capture a higher share of the downstream profits.

Although the specific details and focus of the individual academic articles differ, they nonetheless generally suggest that concerns about non-price discrimination in network industries may well be justified under vertical integration.³ This is especially the case when there is tight upstream regulation. Below, we focus on two of these studies – Economides (1998a) and Beard, Kaserman and Mayo (2001). These typify the different models considered by the various studies and so provide a good basis for analysing the non-price discrimination incentives of a vertically integrated monopolist.

Economides (1998a) shows that a vertically integrated monopolist which competes downstream always has an incentive to engage in non-price discrimination by reducing the quality of inputs sold to downstream competitors (in imperfectly competitive markets). He finds that this incentive persists even when the vertically integrated monopolist is less efficient than its rivals.⁴ However, there is no incentive to reduce quality if it cannot be done in a discriminatory way (otherwise its downstream division will be affected as well).

In reaching these conclusions, there are a number of relevant considerations. First, the model assumes that the downstream market is imperfectly competitive – this seems a reasonable assumption for most fixed telecoms downstream markets. If it were not – i.e. firms competed on price (Bertrand with no product differentiation) rather than on quantity (Cournot) – there would be no incentive to discriminate. Second, if the vertically integrated operator is unable to selectively lower the quality of the upstream input, it would have no incentive to engage in non-price discrimination because its downstream division would be negatively affected as well

³ The exception is Sibley and Weisman (1998a) who find that a vertically integrated firm may lack the incentive to engage in non-price discrimination. The authors' model is, however, based on the premise that the downstream affiliate's market share is small. The idea is that with a small share in the downstream business, it is in the interest of a vertically integrated firm to foster its upstream division at the expense of its downstream business. In the case of fixed telecoms, it is usually the case that the incumbent operator also has a considerable share of the downstream business. For example, in the UK, BT, as of Q2 2004, had over 82% of exchange lines and over 65% of all retail calls volumes. Therefore, Sibley and Weisman's economic model is of limited practical relevance in the UK.

⁴ Conversely, Weisman (1999) argues that if the vertically integrated firm is less efficient than its rivals, then non-price discrimination may be avoided. If rivals are able to generate more gross profit on each unit of downstream sales, then the upstream firm can capture more of this profit through input sales than it can generate by producing the downstream product itself. Economides notes however that this is a short term effect because the number of downstream firms is kept fixed. However, in the longer run a discriminatory strategy will allow the vertically integrated firm to further increase its profits by forcing its competitors to exit.

(without gaining any comparative cost advantage).⁵ Third, the model assumes that non-price-discrimination is not costly for the vertically integrated firm.⁶ If it were, the incentive would decrease.

In contrast, Beard, Kaserman and Mayo (2001) using an alternative model find that the incentives to non-price discriminate emerge only in the presence of a binding regulatory constraint at the upstream level. The model assumes that in the upstream market a dominant firm competes with a small competitive fringe that sells comparable products and that the downstream industry is composed of two types of firms – the vertically integrated firm and unintegrated downstream competitors – that offer differentiated products and engage in Bertrand price competition.

If the upstream dominant firm engages in non-price discrimination, the upstream competitive fringe is assumed to respond as if the dominant firm's input price were raised and so they increase their output. In the absence of regulation, non-price discrimination would have no value because the dominant strategy would be able to raise the input price rather than engage in non-price discrimination. However, if strong regulation on the input exists, non-price discrimination will be profitable for the integrated firm because regulation limits the ability of the firm to extract full rents from its dominant position. The price-cost margin at both the upstream and downstream levels can thus have a considerable influence on the dominant firm's incentive structures. Similarly, the intensity of competition at the upstream level - i.e. the dominant firm's market share and the price elasticity of fringe firms' supply - will play a significant role in affecting the dominant firm's incentive to engage in non-price discrimination.

In summary, it would appear that the incentive to engage in non-price discrimination depends on a number of factors. Surveys of the literature conducted by Mandy (2001) and Reiffen & Ward (2002) suggest, in particular, that the incentives to discriminate increases:

- The tighter is price regulation of the upstream input and the less intense is upstream competition;
- The larger the potential profit opportunity in the downstream market;
- The higher the degree of substitutability of the vertical integrated and competitors' products; and
- The larger the economies of scale in downstream activities.

⁵ Sappington and Weisman (2005) show however that a vertically integrated operator may have an incentive to "self-sabotage", if the symmetric application of the resulting higher costs or lower quality harms competitors more than it harms the vertically integrated player. This may occur if a cost increase is particularly detrimental to competitors (because they face a greater risk of bankruptcy or use the more costly input more intensively than the vertically integrated firm, for example) or if competitors serve customers that value service quality very highly. In these circumstances, the authors find that self-sabotage tends to be profitable for the vertically integrated player the more downstream rivals it faces, the more homogeneous are its products and the products of its rivals and the more inelastic is the demand for the vertically integrated player's downstream product.

⁶ Economides also shows that the same result is obtained if non-price discrimination is considered not as raising cost for the downstream firms but reducing the consumers' willingness to pay for their products (i.e. lower quality).

4. THE INCENTIVES TO DISCRIMINATE IN UK FIXED TELECOMS

In the following sections, we examine these factors for the UK and assess the incentives that BT may have to engage in non-price discrimination.

This is important for two reasons. First, Ofcom only provided a limited discussion of these in public documents (Ofcom 2005, F.32 – F.38). Second, the asymmetry of information that exists between firms and regulators means that the latter will always be at a disadvantage to put forward evidence of actual discrimination. This means that in deciding whether or not to impose remedies which are necessarily forward-looking, an empirical analysis of the theoretical factors (which in this case strengthen the incentives to non-price discriminate) is likely to be useful complementary evidence.

Tight upstream regulation

Tight upstream price regulation is likely to strengthen the incentive to discriminate. By hampering downstream competitors, the vertically integrated firm may lose some of its upstream sales, but if, upstream margins are kept low by regulation, this has limited impact on overall profits.⁷ Alternatively, the less intense is upstream competition, the greater the gains from non-price discrimination because downstream competitors have a limited range of alternative suppliers to switch to.

In the UK an examination of the development of regulatory obligations since the mid-90s, with a focus on cost based price controls⁸ shows that regulation of fixed telecoms upstream inputs is tightening and expanding to a growing array of inputs. Figure 1 shows that the reductions in the Network Charge Controls (NCC) – i.e. the regulated charges for a range of narrowband telecommunications upstream services - between 1998 and 2004 have been substantial in real terms.⁹ Furthermore, over the same period the scope of the NCC has increased - e.g. the inclusion of Flat Rate Internet Access Call Origination (FRIACO) – and the baskets have been further disaggregated - i.e. separation of Call Origination from Single and Local Tandem. Although, Ofcom has recently relaxed the price controls on the NCC for the 2005-09 period, this relaxation of controls is, however, on an incremental basis and the proposed charge reductions are on top of significant past reductions. Similarly BT's local loop unbundling (LLU) wholesale charges, which are not part of NCC, have also fallen significantly since LLU was mandated.¹⁰

⁷ The profit gain in downstream markets is expected, therefore, to be larger than the possible loss in upstream profits.

⁸ Although these are not the only remedies that have an impact on the profitability of BT's upstream activities, they have the most direct impact. Other obligations could have a significant indirect impact on profitability. For example, accounting separation is designed to reduce the asymmetry of information between the regulator and the regulated company and, insofar as it leads to more accurate regulation, it could potentially limit BT's profitability. However, these indirect effects are often difficult to assess.

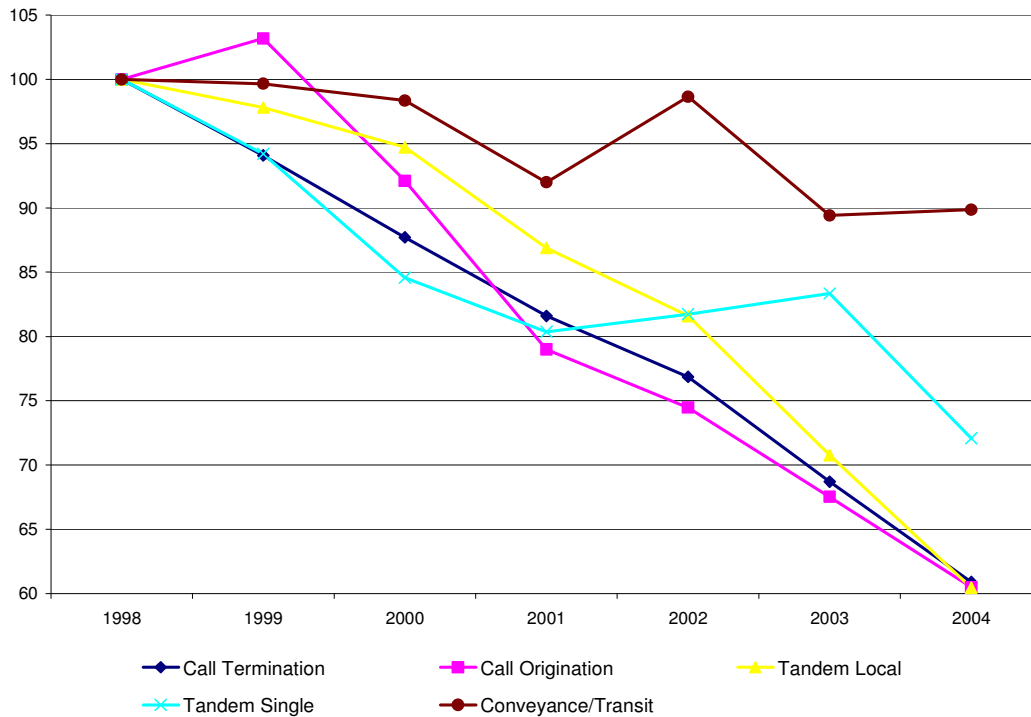
⁹ The largest reductions took place for services that account for most of BT's revenues from NCC – e.g. call termination, call origination and local tandem consisted of at least 80% of all NCC revenues and over the course of six years they declined by about 40% in real terms.

¹⁰ See BT's *Carrier Price List* and Ofcom, *Review of the wholesale local access market*, 16 December 2004.

These reductions reflect Ofcom's estimates of trends in costs, efficiency and cost of capital over the same period. While incentive regulation allows the firm to keep any additional profits it can achieve from increased efficiency over the charge control period, it would appear that upstream price controls provide a strong and binding constraint on BT's ability to exploit its upstream market power.

The evidence suggests, therefore, that BT's upstream inputs are subject to strong regulatory constraints and as a consequence may provide it with an incentive to non-price discriminate.

Figure 1: Average NCC charges from 1998-2004 (real terms, 1998 prices, 1998=100)



Source: *Regulated Accounts, RPI* from UK Office of National Statistics.

Downstream Profitability

The higher the downstream profit opportunity the more likely it is that hampering downstream competitors to obtain a larger share of a profitable market will increase the vertically integrated incumbent's overall profits. Only when the downstream market is perfectly competitive would the incumbent be indifferent between discriminating or not. The incentive to hamper rivals may, however, exist even in perfectly competitive downstream markets if it makes upstream entry more difficult.

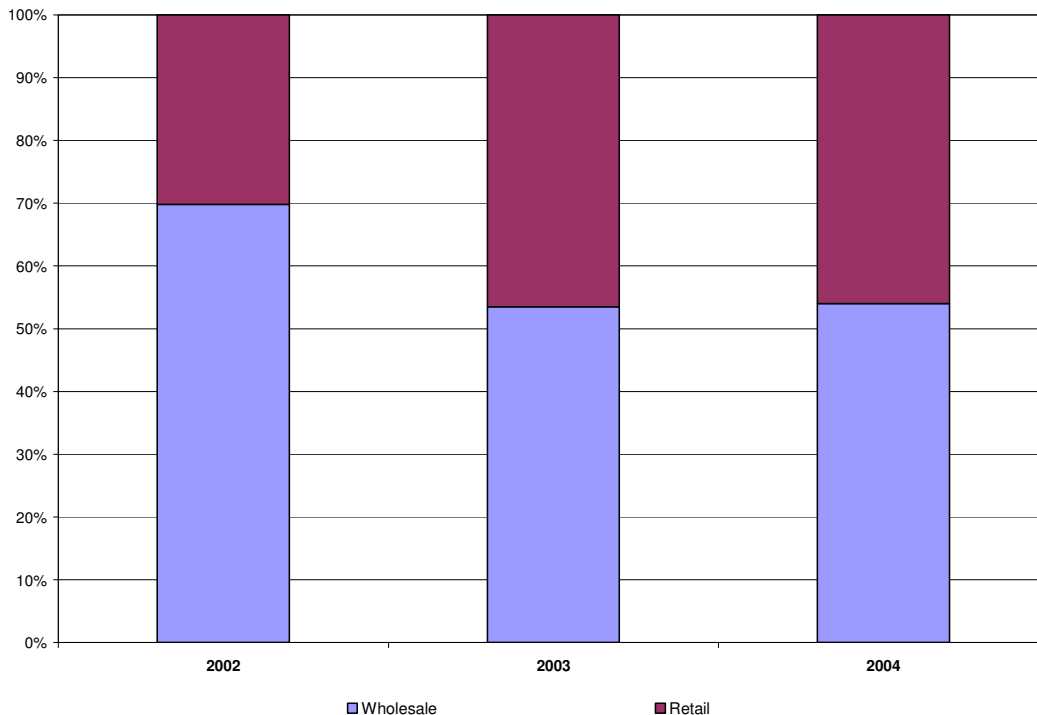
Below, we examine how the profits of BT's downstream division, known as BT Retail, have evolved over time using publicly available information. The analysis is based on BT's *Annual Accounts* and its *Regulatory Accounts*. It should be noted, however, that the *Annual Accounts* are based on historical cost accounting whilst the *Regulatory Accounts* are based on current cost accounting.¹¹ Despite the differences

¹¹ At the retail level, however any discrepancy is largely immaterial.

between the *Regulatory* and *Annual Accounts*,¹² the analysis below provides useful indicative information on relative profitability trends for BT's downstream and upstream businesses.

An analysis of the *Annual Accounts* for the period 2002 to 2004 suggests that BT Retail's profits are not insignificant and represent an increasingly large proportion of BT's overall profits. There are some indications that returns are also increasing. Figure 2 below shows the share of operating profit between BT Retail and BT Wholesale. The profit share of BT's Retail division has been increasing steadily over the years, suggesting that BT's downstream business profitability is increasing relative to the regulated upstream activities. This is confirmed by the Return on Sales (ROS) for BT Retail which increased from just over 6% in 2002 to about 10% in 2003 and 2004 (see Figure 3 below).

Figure 2: BT Group's Share of Operating Profit between Wholesale and Retail Divisions



Source: *BT Annual Accounts*.

Figure 3 shows total profits and returns for BT Retail and BT Wholesale based on BT's *Regulatory Accounts*. The data has been split into two separate periods, 1998–

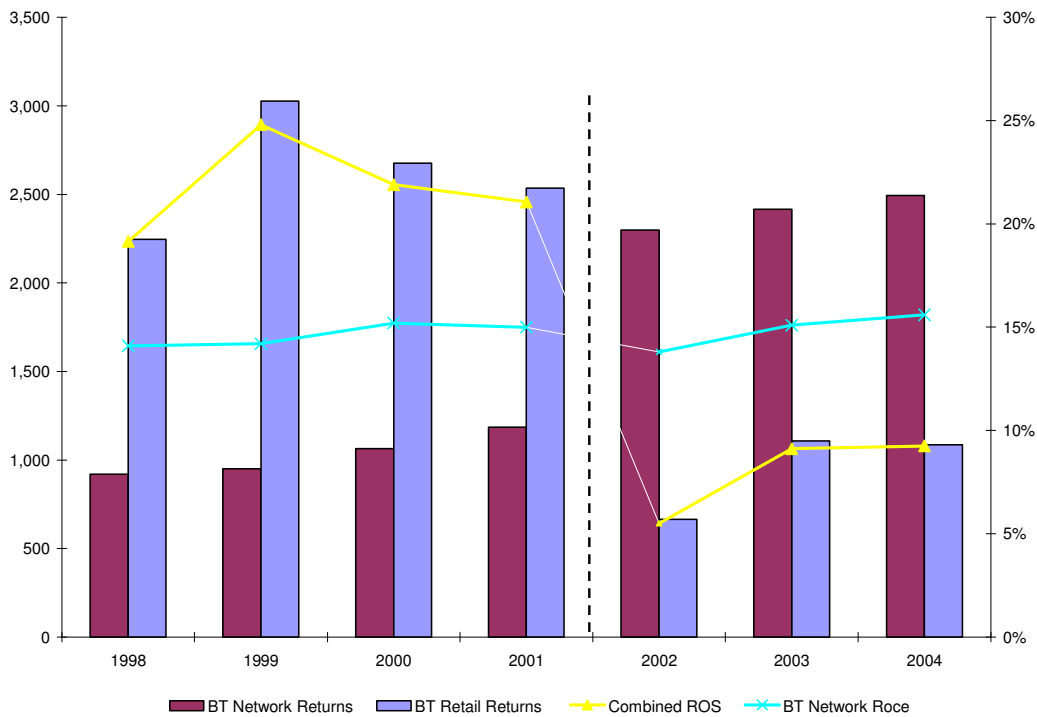
¹² There are differences between BT's definition of its downstream business division (*Annual Accounts*) and the *Regulatory Accounts* definition for downstream activities. According to BT's Annual Report for 2004, BT Retail includes voice services and equipment sales associated with this, intermediate products, such as private circuits and ISDN, ICT products, Broadband products, Mobility products, through BT Mobile Home Plan, and other products. Thus, BT Retail in the *Annual Accounts* includes both regulated and unregulated products. To derive a similar set of products from the *Regulatory Accounts*, we use the aggregation of "Retail Narrowband Access Business" and "Retail Systems Business" – this we refer to as BT Retail (*Regulatory Accounts*). The *Regulatory Accounts* only include information on the downstream activities of PSTN access services from 2001 (previously these retail activities were included in an end to end access business).

2001 and 2002–2004 because the data for the two periods are not strictly comparable.¹³

Although the two measures of profitability – Return on Sales (ROS) and Return on Capital Employed (ROCE) - are not comparable across business divisions¹⁴ and time periods, they nonetheless suggest an increasing trend in BT Retail’s profitability in the latter period (2002 to 2004).

Thus, despite the data limitations, the evidence from both the *Regulatory Accounts* and the *Annual Accounts*, suggests that both BT’s downstream division’s contribution to overall operating profit and its profitability are increasing which supports the argument that BT might have an incentive to hamper downstream rivals.

Figure 3: Total Returns and Profitability for BT Network and BT Retail 1998- 01 and 2002-04



Source: BT Regulatory Accounts.

Product Differentiation

The incentive to discriminate also increases the higher the degree of substitutability of the downstream services. If products are close substitutes, the sales lost by competitors due to discriminatory behaviour will be largely captured by the vertically integrated firm’s downstream division. In some circumstances the incentive to

¹³ For 2001-2004 the access network costs were transfer charged at cost plus the regulated cost of capital from the network business to the "Retail Narrowband Access Business".

¹⁴ The upstream business is highly capital intensive. Conversely, the retail business has a very low asset base. This is why ROCE is more appropriate for the upstream business but ROS is preferable for the downstream one.

discriminate may also arise when downstream products are highly differentiated. This is particularly relevant in a dynamic context in relation to product innovation.¹⁵

In the UK, while downstream (or retail) services in traditional fixed telecoms markets are homogeneous – e.g. voice calls or line rental – it could be argued that there is at least some scope for product differentiation for new services. For example, in the provision of broadband Internet access, BT's and its competitors' products are differentiated – i.e. upstream and downstream bandwidth, web space, contention rates etc. However, because no provider bases its offer on proprietary technology¹⁶ and content¹⁷ delivered over UK fixed networks is very rarely exclusive and, so far, of limited importance, most firms provide a similar range of services. This means that BT is potentially able to replicate any of its competitors' downstream services and so could capture a large proportion of the sales lost by its competitors as a result of any anticompetitive discriminatory behaviour. Further, even if rivals could successfully differentiate their downstream services on the basis of proprietary technology, services or exclusive content, they are likely to still need to rely on BT for upstream inputs. Therefore, BT could still have the capability to substantially hinder its rivals.

Downstream Economies of Scale

The larger the economies of scale in the downstream activities, the stronger will be the incentive to engage in discriminatory behaviour. If a vertically integrated firm cannot save substantial operating costs when losing sales, it may have an incentive to discriminate in order to prevent a loss of customers. Conversely, the same incentive would exist if by discriminating a vertically integrated firm could gain sales at little incremental costs.¹⁸ The discussion of downstream economies of scale is

¹⁵ If a competitor wanted to launch a new service (which is not a substitute for any of BT's existing services) BT may still have an incentive to discriminate, if by so doing it was able to launch the product in the future and obtain a larger profit than that obtained from supplying the upstream input to the provider of the innovative product.

¹⁶ To enable interoperability between services and suppliers, technology is usually not proprietary. Consequently, although each operator may have an incentive, there is limited ability, to differentiate its services from those offered by its competitors. Attempts have been made to increase product differentiation. For example, service builder type products allow an operator to configure a new network service based on a suite of reusable intelligent components. The idea is to allow a rapid development of intelligent network services - e.g. freephone, follow-me, personal numbering, etc. - which operators can use to differentiate their services. Another approach has been to use OSS - offering one bill or customer portals which allow the customer to dynamically change their service parameters as their requirements change. To date these services have had some success, but can be easily replicated.

¹⁷ Internet Service Providers' (ISPs) have attempted to keep customers within their "walled garden" through the use of compelling content. However, to date these have not been successful. The advent of fixed broadband access also provides further opportunities for content differentiation. However, very few operators have invested in their own proprietary content and have largely if, not solely, obtained content without exclusivity - e.g. commercial arrangements between BT and Yahoo and VNL (Homechoice) and Sky and other broadcasters.

¹⁸ The less capacity constrained the integrated firm is in its downstream production, the less costly it is for the vertically integrated firm to replace its rivals' sales with its own. The incentive to discriminate will also increase, the greater the efficiency of the vertically integrated firm's downstream division. The reason is because margins on each captured sale from competitors will be comparatively higher. Conversely, if its downstream competitors

closely tied to that of downstream profitability. In the absence of marked economies of scale it could be argued that downstream markets could be considered as close to the perfect competition benchmark, making a vertically integrated incumbent indifferent between discriminating or not.

An examination of a plot of BT's unit costs¹⁹ against the number of exchange lines is inconclusive. Unit costs have remained fairly static between 2002 and 2004 – ranging between £360 and £390 - as output increased - from 27.5 million and 29.5 million exchange lines over the same period. Any inference from this exercise would, however, need to be treated with caution given the aggregate nature of the data and the fact that the single output measure used is not necessarily the main cost driver. In addition, the BT cost data spans a small range of output which means that it could only provide information on a small portion of the cost curve. In other words, it is possible that economies of scale might become exhausted at different levels of output for different services. Given this, care must be taken in any interpretation of this data.

An alternative approach in the absence of detailed data on a service by service basis²⁰ is to consider the categories of downstream costs which have a fixed cost component such that there may be economies of scale. While, in principle, smaller operators could outsource many of the downstream functions, beyond a certain level of output the outsourcing option might not always be efficient or viable. Economies of scale could exist in some aspects of downstream activities for example in marketing and sales (but especially advertising on national media),²¹ customer services,²² billing (management of bad debt risks) and headquarters. There are also likely to be economies of scale in activities such as switching at the local exchange where the larger the number of operators demanding LLU products, the more cost effective it becomes for products based on LLU to be offered at lower unit costs. For some of these cost items, such as customer services, BT has signalled its intention to invest in automation.²³ This means that the costs of such activities would no

were more efficient, the vertically integrated firm would have a stronger incentive to “sub-contract” the downstream activity to third parties.

¹⁹ Calculated as total retail operating costs in the *Regulatory Accounts* divided by the number of exchange lines.

²⁰ We are not aware of any empirical study on economies of scale for downstream activities in telecoms or other industries.

²¹ Advertising is a critical component in most retail activities. Certain types of advertising such as national advertising consist of a large fixed and sunk cost which is largely endogenous i.e. each operator could decide the level of its advertising efforts. However, it is likely that in many retail products, a certain amount of advertising is unavoidable. Investing in advertising (which has no resale value upon exit) could be seen as a strategy to sink costs. The purpose of this is ultimately to lead to a more consolidated market structure and reduce the degree of competition in the market (Sutton, 1991).

²² It is likely that costs for call centre(s) and back office system integration do not increase linearly, as there are some fixed set-up costs and costs associated with certain levels of output.

²³ BT reported that during the financial year 2003/04 business online orders increased from 7% to 21% while business online help usage increased from 29% to 56%. See BT Briefing, *BT Retail – SME Broadband Strategy Briefing*, 29th April 2004. Similar if not higher figures are reported for all consumers in BT Briefing, *BT Retail Consumer Broadband Strategy*, 11th March 2004. It is claimed that consumer online orders range between 60 and 65%, business

longer be variable but would become fixed. There are strong overall cost incentives to pursue this. However, in doing so BT's incentives to retain marginal customers and to discriminate against downstream competitors could also increase.

From the above discussion it appears, therefore, that there are some fixed costs which at lower levels of output are likely to generate increasing return to scale. For BT this is likely to be the case for new services such as broadband and perhaps LLU where its customer base has not yet reached the level of more mature services such as line rentals or call services.²⁴ The level of advertising, which is often a fixed cost, is also likely to be larger, simply because in this case advertising is targeted at consumers with limited prior information compared to more mature services. This means that for new services it is more likely that BT has not yet exhausted economies of scale. Given that these are precisely the services in which BT faces the strongest competition because it does not have a large inherited customer base whose behaviour is characterised by inertia, BT may therefore have a stronger incentive to discriminate in such markets. Moreover, it could be argued that some costs which appear to be variable such as, for example, the provision of consumer equipment for broadband connectivity (i.e. modems), may be inversely related to the scale of the downstream operation because of discounts that larger downstream operators could obtain due to their buyer power in purchasing equipment.

5. THE REGULATORY TREATMENT OF NON-PRICE DISCRIMINATION

Having discussed how a vertically integrated fixed telecoms incumbent may have an incentive to engage in non-price discrimination and provided some evidence for the UK, we now turn our attention to the appropriate regulatory response.

We first discuss how a *per se* ban on non-price discrimination may be justified in this case. This makes competition law *ex post* intervention inappropriate. We also discuss the difficulties in detecting such behaviour, which render "traditional" *ex ante* prohibitions unlikely to be effective. Second, we discuss alternative remedies and briefly describe the rules adopted in the UK.

online orders are at 24% and 80% of consumer and now 40% of business assistance is online.

²⁴ BT has claimed in the past that the upfront costs for "Development and Systems" for broadband could be significantly reduced because of economies of scale when the customer base reached one million. For example, in 2004 BT claimed to have achieved a more than 50% reduction in the helpdesk costs per user over the financial year 2003/04. A possible interpretation is that this could be due to economies of scale and increased efficiency (learning by doing). Indeed, it is often difficult to distinguish between the two. For example, while learning by doing might affect the unit cost of provision over time it could also be claimed that as the scale of the operation increases there may be efficiencies which can be exploited at larger scale. It may therefore be very difficult to disentangle the two effects. See BT Briefing, *BT Retail – SME Broadband Strategy Briefing*, 29th April 2004. Similarly, BT reported that during the financial year 2003/04 it had achieved 20% sales process savings and 35% savings in helpdesk costs. See *BT Briefing, BT Retail Consumer Broadband Strategy*, 11th March 2004.

Could a per se ban of non-price discrimination be appropriate in fixed telecoms?

Competition authorities generally use a *rule of reason* approach when dealing with price discrimination because of the ambiguity of the welfare effects from this behaviour. In the following paragraphs, we consider whether the approach taken to examine non-price discrimination in a regulatory context should be different to that adopted for price discrimination. In particular, we examine the case for a *per se* ban. We claim that at the downstream level there is no justification to treat price and non-price discrimination differently. However, we consider that the issue examined here is different in many respects. First, when discrimination of any type takes place upstream, the welfare implications are more likely to be negative. Second, when the incumbent is vertically integrated, the possibility for leveraging should be considered. Third, we argue that although the sabotage literature focuses on non-price discrimination, the incumbent has a potential choice of price and non-price tools (or any combination of the two) to discriminate. However, acting on non-price terms is a dominant strategy as it is both less costly to implement and less likely to be detected and hence punished – i.e. Bernheim and Willig (1996). This means that although *ex ante* obligations may be effective for price discrimination, they are considerably less so for non-price discrimination.

Downstream discrimination

Because the welfare effects of price discrimination at the downstream level are ambiguous, competition authorities treat it under a *rule of reason*. This is currently the position adopted by the UK Office of Fair Trading (OFT 2004, paras 3.6 to 3.8) although the European Commission currently leans towards prohibiting all forms of discrimination.²⁵

By price discriminating a downstream monopolist is able to extract more surplus and often expand output to serve a larger number of consumers. A necessary condition for total welfare to increase under price discrimination is that a monopolist expands output by moving from uniform pricing to (third degree)²⁶ price discrimination – e.g. Schmalensee (1981) and Varian (1985). Thus, in this case price discrimination increases total welfare, although its distribution will change with a transfer from consumers to producers. In essence, this means that imposing an absolute ban on price discrimination in these circumstances may lead to lower output, for example, because some (smaller) markets may no longer be served. A ban could also negatively affect long term welfare by reducing profits and incentives to innovate and lead to excessive and inefficient entry in those markets which absent the ban would face lower prices. Furthermore, in an oligopoly setting Holt and Scheffman (1985) and Cooper (1986) showed that a ban on price discrimination may facilitate collusion.

²⁵ This is, however, largely based on political considerations which are reflected by the dual goal of the European Commission in this area: to protect competition and further market integration to which geographical discrimination is considered an obstacle.

²⁶ There are two conditions that allow a firm to price discriminate. First, the firm would need to be able to sort consumers according to their willingness to pay. This may vary from the theoretical case of first degree price discrimination (where the firm has perfect knowledge of each individual consumer) to the more realistic cases of second and third degree price discrimination. Second degree price discrimination occurs when the firm offers a menu of offers which consumers select – i.e. quantity discounts. Third degree price discrimination arises when a firm is able to offer different deals based on observable characteristics – i.e. student or pensioner discounts. Second, arbitrage should not be possible.

On the other hand, price discrimination can have also anticompetitive effects by either deterring entry or inducing exit.

While the above discussion is framed in terms of price discrimination one may legitimately wonder whether non-price discrimination should, in general, be treated any differently. Posner (2001) defines price discrimination as the selling of the same product (in terms of quality and cost) to different consumers (or the same consumers at different points in time) at different prices. Alternatively, it may consist of selling a product at a similar price despite the underlying costs being different. Non-price discrimination could be thought to occur when a firm supplies goods with different quality levels for a given price and cost. Notwithstanding the difficulties in the definition of costs and quality, there is little difference in practice between the effects of price and non-price discrimination.²⁷ The same anti or pro-competitive effect could be obtained by either discriminately raising the price of a service of a given quality or discriminately reducing the quality of a service for a given price (OFT 2004, paras 3.1 to 3.10).

Upstream Price Discrimination

The case of interest here is not, however, about downstream but upstream competition. When a monopolist price discriminates upstream, it is more likely that welfare is reduced.

Katz (1987) finds that third degree price discrimination by an upstream monopolist reduces welfare unless it prevents inefficient backward integration.²⁸ De Graba (1990) also shows that welfare is reduced under price discrimination. He shows that in the short run, an input monopolist has an incentive to charge higher prices to more efficient downstream suppliers. This is because a firm with a lower marginal cost has a more inelastic demand for the input (under a linear demand assumption), which provides an incentive for the input supplier to charge a higher price. That has the effect to partially offset the cost advantage of the more efficient firm. The result is therefore that welfare is reduced under price discrimination because more efficient firms produce less than under uniform pricing. In the long run, price discrimination also affects the incentives for downstream firms to adopt efficient production technologies. In this setting, firms can choose between a technology with low marginal cost and a high fixed cost and one with high marginal costs and low fixed costs. De Graba shows that under price discrimination downstream firms would have an incentive to select the technology with the higher marginal cost because this attracts a lower input price. Thus, in the long run, welfare is, also, reduced.

Valletti (2003) extends and generalises the work by De Graba (1990) and Yoshida (2000). He argues that under uniform or linear pricing²⁹ the upstream monopolist

²⁷ In most cases in order to produce a higher quality product a firm will have to incur some additional cost. This further complicates the analysis as, unlike price discrimination, discriminating on the basis of quality could carry some costs savings.

²⁸ Katz models an input monopolist supplying a homogeneous good to several downstream markets where a local firm competes with a chain present in all markets. When a large downstream firm can credibly threaten to integrate backwards into the production of an input, it can obtain better terms for that input than firms who cannot carry out that threat.

²⁹ He points out that if the upstream monopolist used two part tariffs then it would select the most efficient downstream provider and charge a variable component at marginal cost and extract all the profit with the fixed component.

would exploit the differences in the downstream suppliers' elasticities. This leads (under most specifications and assumptions) to the most efficient firms being charged the highest input price. The only (unlikely) exception is when the firm that is most efficient in using the input is the least efficient in using the other inputs.

The above suggests, therefore, that input price discrimination could be welfare-reducing. Haucap & Wey (2004) argue, however, that the above conclusions hold only when entry is not possible in the downstream market.³⁰ When entry is allowed, these conclusions may not hold and so the results could be similar to those of Schmalensee (1981) and Varian (1985) - i.e. discrimination could increase welfare if output is expanded.³¹ Haucap & Wey distinguish between a static and dynamic framework. In the former case, they conclude that welfare is more likely to increase due to entry. However, in the dynamic case, the effects on welfare are ambiguous. The reason is because discrimination could either spur innovation and lead to cost reductions or it could lead to monopolistic competition.

In conclusion, although this literature examines the effects of price discrimination, the implications could also extend to non-price discrimination. It suggests that upstream price discrimination could reduce welfare if the downstream market structure is not open to entry. However, if entry is allowed, then the results are ambiguous. This may therefore provide some support for a *per se* ban of upstream discrimination.

Leveraging

In the case examined here, discrimination takes place upstream and is undertaken by a vertically integrated incumbent. The addition of vertical integration complicates matters. Specifically, in addition to the welfare effects of upstream discrimination, concerns about the incentives to engage in the leveraging of market power could also arise.

In a static framework the main aim of leveraging of market power is to capture profits in downstream or complementary service markets. The literature on sabotage reviewed above is an example of this type of leveraging. However, by restricting downstream competition, a vertically integrated firm could also engage in dynamic leveraging. In essence, this strategy could prevent the emergence of strong competitors in a downstream or related market who could in the future threaten to enter the upstream market or vertically integrate backwards thereby threatening the position of market power of the vertically integrated firm in the upstream market. This issue has been specifically explored in the context of tying (Nalebuff, 1999, 2000) (Carlton and Waldman 2002) and has become more prominent because of the various investigations related to Microsoft (Choi 2004), but it could equally apply to other types of leveraging practices. In particular, as innovation becomes increasingly important in fixed telecoms, dynamic leveraging issues may also need to be considered alongside static ones.

³⁰ Haucap & Wey's model is similar to DeGraba's but also includes a (less efficient) potential downstream entrant.

³¹ Haucap & Wey's conclusions are based, among others, on the important assumption of constant upstream marginal costs. It is worth observing that in the provision of fixed telecoms access or other network services this may not hold as the cost of provision varies geographically. In this case the imposition of non-discrimination obligations could provide incentives for inefficient entry by upstream providers.

The presence of cost based price controls on upstream inputs additionally needs to be considered. The literature on sabotage assumes (either implicitly or explicitly) that *ex ante* regulatory obligations on the upstream monopolist prevent it from price discriminating and from setting supra-competitive input charges. This means that it is restricted to act on non-price terms in order to leverage its market power downstream. However, if the *ex ante* non-discrimination obligations are not fully effective then the upstream monopolist has a choice of whether to act on price or non-price terms depending on the relative risks and benefits (i.e. impact on long term profits and the probability of being detected and punished). *A priori*, it is difficult to conclude whether the firm will have a preference for one or the other.

Assume first that the vertically integrated firm faced the same probability of being detected (and punished) if it acted on price and non-price terms. Acting on price terms means engaging in a margin squeeze by lowering its downstream price. However, regardless of whether a margin squeeze could be successful (if undetected), in this case it would come at a short term cost in terms of forgone profits, as it would require a reduction in its downstream price. In contrast, acting on non-price terms may have similar effects on downstream competitors, but would not necessarily be costly for the vertically integrated firm. Therefore, when the probability of detection is the same, a vertically integrated firm could have a preference for non-price discrimination.

However, the probability of detection is unlikely to be the same. It is clear (due to the nature of the practice) that the probability of detection is likely to be higher in the case of price discrimination. However, in the case of non-price discrimination the opposite is likely to apply. Due to the asymmetry of information that exists between the regulated firm on one side and its competitors and the regulator on the other, it is likely that the latter may be both unable to fully judge whether the inputs sold by the regulated firm are of lower quality. In order to be detectable, firstly such behaviour needs to be observable³² and secondly, even if it is observable, it needs to be verifiable.³³ In other words, although the behaviour may be (imperfectly) observable

³² An example of the difficulties in observing anticompetitive behaviour is provided in the following. The Italian competition authority, Autorità Garante della Concorrenza e del Mercato (AGCM), found that Telecom Italia, (the Italian fixed line incumbent) had abused its dominant position by engaging in a number of anticompetitive practices, among which also featured non-price discrimination. More specifically, AGCM found that when Telecom Italia bid for large business customer contracts, it offered significantly better service features than those that its rivals could achieve by making use of its upstream inputs. The tendering process in the downstream market meant that the terms offered by Telecom Italia to large business customers were not directly observable by the regulator other than by the business customers. Thus, despite the regulator setting the upstream features in the published Service Level Agreements (SLA), it had no visibility of what was being offered. The existence of examples of non-price discrimination behaviour was only revealed when the AGCM opened an investigation into other types of abuses. See AGCM, *Comportamenti Abusivi di Telecom Italia*, A351, 16 November 2004, available at http://www.agcm.it/AGCM_ITA/DSAP/DSAP_287.NSF/0/135e3f170a5e29abc1256f9e0059dc_d7?OpenDocument, paras 156-163 and 488-498.

³³ An example of the difficulties of collecting the necessary evidence is the following. The UK Gas and Electricity Markets Authority investigated alleged anticompetitive behaviour by a vertically integrated electricity provider, United Utilities Electricity (UUE) under the Competition Act. The complaint was against UUE's conduct for new electricity connections to its distribution network for which UUE's downstream arm, United Utilities Network (UUN)

the regulator may fail to collect the relevant supporting evidence in order to ensure a favourable decision. This is especially the case when the technical complexity of the services is high and it is subject to rapid or frequent technical changes. The inability to detect and verify such anticompetitive behaviour could, therefore, reduce the deterrence effect of punishment and strengthen the incentives to engage in such discriminatory behaviour. This makes the use or strengthening of pecuniary fines also not particularly effective.

The above discussion suggests, therefore, that a vertically integrated firm could have a preference for non-price discrimination as a means to put downstream rivals at a disadvantage. Therefore, both *ex ante* controls, for example in the form of either generic non-discrimination rule or Service Level Agreements (SLAs), and *ex post* remedies are unlikely to be very effective.

In need of different remedies?

The above analysis therefore presents regulators with a difficult problem. A type of behaviour has been identified for which a *per se* ban could be justified, but where traditional *ex post* and *ex ante* regulatory remedies may be inappropriate. In this part of the section we briefly consider alternative remedies. These range, in principle, from vertical separation of ownership through to other forms of (functional or operational) separation and *ex ante* remedies, such as differently structured access charges.

Several commentators have been sceptical of ownership or vertical separation³⁴ - for example, Cave (2002), and OECD (2003). They recognise that although such separation removes the incentive to discriminate, there are severe practical difficulties. First, given that the aim is to separate the monopoly elements from the competitive activities, the lack of a clear and stable point of division is problematic. It will be close to impossible to repeat or undo the exercise if the chosen dividing line proves to be incorrect or to have shifted over time. This point acquires greater strength as a result of current plans to introduce so-called Next Generation Networks (NGNs), which in some cases have a different architecture from current networks. There is, therefore, a clear risk that an inappropriate market structure could be fossilised by ownership separation.³⁵ Secondly, separation will make it harder to co-

competed with other providers. It was alleged that UUE's was delaying the provision of relevant information to downstream rivals – i.e. a form of non-price discrimination. The information held by UUE was essential for UUE's rival to be able to compete in the provision of new electricity connections. Although the Authority found substantial evidence of delays, it concluded that the competitive effects were ambiguous. On this basis and due to the fact that UUE had in the meantime legally separated UUN and changed the way in which it provided information, no infringement was found under competition law. However, evidence of delays led to further consideration as to whether further regulatory action was required. Gas and Electricity Markets Authority, *United Utilities Electricity PLC*, 17 December 2004, available at <https://www.ofg.gov.uk/Business/Competition+Act/Decisions/United+Utilities+Electricity.htm>.

³⁴ The separation of ownership discussed here is a vertical one within a single value chain (for example, separating access from the core network and retailing, or separating retail from network activities). This differs in its effects from the divestment by a firm of one or two or more separate networks which it may own, such as a telecommunications and a cable network.

³⁵ This was an argument that was made in the context of the divestiture decree which resulted in the structural separation of the Regional Bell Operating Companies (RBOCs) from AT&T. As cited by Huber, Kellogg and Thorne (1993) in their study “ [b]y 1984 it became

ordinate activities across the ownership boundary. Economies of scope in operations will be affected, but, more significantly, it will be harder to co-ordinate investment in new technologies which cross the boundary (the most likely candidate being the intelligent or software element of the network). Third, the monopoly assets will still require regulatory interventions, and the new structure may provide reduced incentives for investment which are particularly important in a dynamic industry. Therefore, the idea that regulatory intervention could be simplified may not prove true. Lastly, in the past attempts to structurally separate telecommunications incumbents have often failed, with the exception of the break-up of AT&T. For example, some states in the United States, and in particular Pennsylvania, have recently considered both structural and functional separation, but had to settle for a much milder code of conduct (Crandall & Sidak, 2002)

These considerations have led governments and regulators to consider remedies which fall short of ownership separations. The setting of access prices could take into account the expected incentive to engage in non-price discrimination, which, as noted above, increases as access prices are set closer to their long run incremental costs. Thus, it is possible to calculate the access price, and the access provider's consequential level of non-price discrimination, which would maximise welfare (Sand 2003). However, the difficulty is that the regulator would have to know the access provider's response functions and the relative detriment to consumers associated with excessive access prices and with the degradation of the access product supplied to access seekers. This is likely to be a very difficult exercise, but, even if it were possible, accommodating anti-competitive behaviour is clearly second best to eliminating it.³⁶

Laffont and Tirole (2000) have noted the desirable properties of a global price cap (embracing both input and final services) in providing appropriate incentives to a vertically integrated access provider to jointly price its upstream and downstream services efficiently under a regime of incentive regulation. However, global price caps are known to create incentives for price squeezes, and the enforcement of prohibitions against such behaviour will be especially problematic where the vertically integrated firm can vary not only the price but also the quality of the access product.

Accordingly the remainder of this brief discussion focuses on functional separation – that is specific remedies aimed at countering non-price discrimination, possibly combined with changes in the internal governance and incentive arrangements of the vertically integrated company. These arrangements are specifically designed to counter the ability (and to a more limited extent the incentive) to engage in non-price discrimination while avoiding the costs of structural separation. In Australia, an obligation of functional separation has been imposed upon Telstra, the telecommunications incumbent, and a draft determination published in December

apparent that the techno-economic rationale for divestiture was already obsolete given the technological changes within the industry". In particular, they argued that the development of mobile and radio technology offered the prospect of competition for local calls and given the absence of large sunk costs, this meant that the natural monopoly status of local access could be ended.

³⁶ This argument has parallels with the proposition that access charges should be lowered in response to imperfect competition in downstream markets. Here, the superior policy is to eliminate or restrain the downstream market power, just as in our case the superior policy is to exclude non-price discrimination.

2005 (DoCITA 2005), but the regime has not yet been finalised or implemented.³⁷ In New Zealand, the incumbent operator, Telecom New Zealand, is proposing voluntarily to functionally separate into wholesale and retail components³⁸. As a result, the fullest illustration of such a process is provided by the United Kingdom. The UK experience is briefly described below. Having discussed how a *per se* discrimination prohibition could be justified, we describe the stricter form of non-discrimination obligations recently adopted in the UK. However, these would be insufficient if the ability to detect anticompetitive behaviour was not also enhanced through a set of arrangements that may be described as functional separation.

The UK example

In the UK, following the conclusions of Ofcom's Strategic Review of Telecommunications, BT offered a number of undertakings aimed at addressing concerns related to its ability to discriminate against downstream rivals.³⁹ These include, among others, a non-discrimination obligation termed Equivalence of Input (Eol) and a type of functional separation. Below we briefly describe both components.

Equivalence of Input

Eol is an obligation on BT to supply a range of upstream inputs⁴⁰ to downstream rivals and its own downstream division "*on the same timescales, terms and conditions (including price) and by the same systems and processes. BT will provide to all providers the same information about these products and their associated services, systems and processes*" (Ofcom 2005, para 2.2). It, therefore, explicitly covers both the price and non-price element of a service.

This is a stronger non-discriminatory obligation than previously available or, perhaps more accurately, a different interpretation of a prior obligation. Under Competition Law and *ex ante* regulation, a non-discrimination obligation means that similar situations should not be treated differently or different situations should not be treated identically. Competition authorities, such as the OFT in the UK, assess both price

³⁷ The draft distinguishes wholesale business units (selling to third parties), retail business units and network services business units. Access services are not treated separately, as in the UK.

³⁸ See www.telecom.co.nz/binaries/q406_presentation.pdf.

³⁹ These undertakings have been offered *in lieu* of a referral under Part 4 Section 155(1) of the Enterprise Act. The latter allows the UK OFT alongside sectoral regulators, such as Ofcom, to make a reference to the UK Competition Commission (CC) when "*it has reasonable grounds for suspecting that any feature, or combination of features, of a market in the United Kingdom for goods and services, prevents, restricts or distorts competition in connection with the supply or acquisition of any goods or services in the UK or a part of the UK.*" However, the OFT or a sectoral regulator such as Ofcom could accept undertaking in lieu of a reference to the CC when it believes they achieve "*as comprehensive solution, as is reasonable and practicable, to any adverse effects on competition identified.*"

⁴⁰ Eol is a legal obligation for a number of upstream regulatory services such as wholesale line rental, local loop unbundling (shared metallic path facility, and metallic path facility), wholesale extension services, IPStream, backhaul extension services and various other services (inclusive of those that will be provided in the future).

and non-price discrimination on a case-by-case basis because the effects of discriminatory behaviour are only likely to be anticompetitive under some circumstances. However, EoI introduces a presumption that under the conditions in which BT operates discrimination would have negative effects on welfare and that, therefore, it should be banned altogether.

An Example of Functional Separation

However, for the reasons set out above - i.e. detectability and verifiability -, EoI on its own might be unlikely to have a significantly different impact than the existing non-discrimination remedies. Therefore, the undertakings also contain a set of rules whose aim is to ensure that EoI is enforceable and that the incentives of the managers of the functionally separated upstream division are targeted towards this end.

The aim of the undertakings is to limit BT's ability to discriminate. By increasing transparency of processes and transactions within the relevant BT divisions, the ability of Ofcom or downstream rivals to detect and therefore deter the behaviour is increased.⁴¹ To this end, BT's network elements termed the "physical layer assets" (excluding switching, electronics or software components termed the "transmission layer assets")⁴² in the part of the network known as access (or local loop) and backhaul - where it had enduring market power - were functionally separated. Essentially, this meant that all the physical layer assets including all necessary personnel were placed into a ring-fenced separate division of the BT group termed the Access Services Division (ASD). ASD will supply most significant access products subject to EoI, including unbundled local loops, backhaul, and wholesale line rental. A further product subject to EoI - IPStream, a wholesale broadband product for resale by competitors, will be supplied by BT Wholesale, but it is expected that its importance will decline as competitors build their own assets. The first two products scheduled to be supplied subject to EoI, IPStream and unbundled loops, were declared to be ready for service by their respective due dates of 31 December 2005 and 30 June 2006.

To strengthen or enforce functional separation, BT also undertook to implement a number of other changes, including, among others that the ASD would:

- have in place a number of rules and procedures that prevent the flow of sensitive business information from BT Wholesale (which includes the activities of the ASD) to BT Retail. Essentially, this means that there is functional separation between BT's upstream operations and its downstream operations, including a Chinese wall between the two;
- provide separate financial and regulatory accounts; and

⁴¹ In the absence of these undertaking it was likely that in engaging in non-price discrimination BT would have enjoyed some costs savings – e.g. there is a need for fewer engineers if faults in rivals' lines are repaired with a delay. If the undertakings are effective in making BT's internal transactions more transparent, BT in order to engage in the same behaviour would need to invest in "costly" concealment. Therefore, functional separation could make non-price discrimination a costlier activity.

⁴² The reason for this exclusion arises from the potential risks in the two divisions failing to co-ordinate investment in this area.

- use a brand (OpenReach) which is separate from that used by the rest of the BT group.

In addition to the above, the undertakings also attempted to reduce BT's incentives to engage in non-price discrimination. These do not modify the incentives that BT, as a whole, might have to discriminate, but their aim is to influence the incentives of key personnel in ASD.⁴³ To do this, the ASD management have been physically separated from the rest of the BT group, and more importantly their remuneration is tied to the performance of the ASD and not that of the BT group. Furthermore, a new internal compliance body called the Equality of Access Board (EAB) has been established to monitor compliance with the undertakings and where appropriate to make recommendations to the management of BT on how to remedy concerns.⁴⁴

It is too early to make an evaluation of the success or otherwise of the Ofcom policy - for an update see (Ofcom 2006b). The most promising sign is that the new regime has replaced a 'fuzzy' prohibition on non-discrimination with a 'bright line' criterion based upon strict equivalence, or equivalence of input. A survey of BT's wholesale customers carried out for Ofcom in early 2006 found that not much had changed so far, despite the enthusiastic and open approach of the ASD's management (Ofcom 2006a). Competitors reported that more staff was needed, and that care had to be taken that equivalence did not mean a levelling down of service levels. It is, however, encouraging that the first two EoI products were ready for service by their due dates.

6. CONCLUSIONS

In this paper we have shown that vertically integrated telecommunications incumbents subject to effective price regulation of services provided by their non-competitive assets are likely to have an incentive to engage in non-price discrimination against access seekers. This type of non-price discrimination is likely to cause welfare losses to end-users. In the UK Ofcom found that this applied to BT. The evidence we have reviewed confirms this view and suggests that BT faces an incentive to engage in non-price discrimination.

As far as regulatory responses are concerned, we believe that "traditional" remedies are likely to be ineffective while ownership separation is likely to be a costly and risky remedy. As a result, attention naturally turns to forms of functional separation which affect the ability and, to a more limited extent, the incentives to engage in non-price discrimination. Such measures enhance the transparency of transactions and change the incentives of the management of the functionally separated upstream division. The UK regulator Ofcom introduced such a regime in 2005.

It is not yet possible to evaluate whether this experiment, alongside similar exercises proposed in Australia and New Zealand will succeed. If it does, and if there is evidence that fixed telecommunications incumbents have similar incentives in other

⁴³ The undertakings apply to a set of existing products but also include rules that ensure that similar if not identical regulations are extended to the services that BT will supply when it upgrades its network under a plan known as "21st Century Network". This ensures that despite the network upgrade, downstream rivals will still be able to purchase unbundled network elements under the same terms.

⁴⁴ The majority of members on the EAB are independent and the minutes of its proceedings are sent to Ofcom. The EAB publishes regular 'updates' on its website.

EU Member States, the next review of regulatory arrangements in the EU may need to consider functional separation among the standard remedial measures open to regulators.

REFERENCES

Beard, T., Kaserman, R.D.I. & Mayo, J.W. (2001), "Regulation, Vertical Integration, and Sabotage", *Journal of Industrial Economics*, 49 Part 3.

Bernheim, B. D. & Willig, R.D. (1996), "The Scope of Competition in Telecommunications", mimeo, AEI Studies in Telecommunications Regulation.

Bustos, A. & Galetovic, A. (2003), "Vertical Integration and Sabotage in Regulated Industries", Universidad de Chile Center for Applied Economics Working Paper No. 164, <http://ssrn.com/abstract=474621>.

Carlton, D. W. & Waldman, M. (2002), "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries", *RAND Journal of Economics*, 33(2), 194-220.

Cave, M. (2002), 'Is Loopco enough?', INFO, 4, pp. 25-31.

Choi, J. P. (2004), "Tying and Innovation: A Dynamic Analysis of Tying Arrangements", *Economic Journal*, 114, 83-101.

Cooper, T. (1986), 'Most-Favored Customer Pricing and Tacit Collusion', *Rand Journal of Economics*, 17, 377-388.

Crandall, R.W. & Sidak, J.G. (2002), "Is Structural Separation of Incumbent Local Exchange Carriers Necessary for Competition?", *Yale Journal on Regulation*, 335-411.

DeGraba, P. (1990), "Input Market Price Discrimination and the Choice of Technology", *American Economic Review*, 80(5), 1246-53.

Department Of Communications, Information Technology and the Arts (DOCITA). (2005), (Draft) Telecommunications (Requirements for Operational Separation Plan, Determination (No. 1).

Economides, N. (1998a), "The Incentive for Non-Price Discrimination by an Input Monopolist", *International Journal of Industrial Organization*, 16, 271-84.

Economides, N. (1998b), "Raising Rivals' Costs in Complementary Goods Markets: LLCs Entering into Long Distance and Microsoft Building Internet Explorer", New York University Center for Law and Business Working paper #CLB-98-004.

Haucap, J. & Wey, C. (2004), "Input Price Discrimination (Bans), Entry and Welfare", mimeo.

Holt, C. & Scheffman, D. (1985), "The Effects of Advance Notice and Best Price Policies: Theory with Applications to Ethyl", FTC, Bureau of Economics, Working Paper 106.

Huber, P. W., Kellogg, M. K. & Thorne, J. (1993), "The Geodesic Network II: 1993 Report on Competition in the Telephone Industry", The Geodesic Company, Washington, D.C.

Katz, M. L. (1987), "The Welfare Effects of Third-Degree Price Discrimination in Intermediate Goods Markets", *American Economic Review*, 77(1), 154-67.

Mandy, D. M. (2000), "Killing the Goose That May Have Laid The Golden Egg: Only The Data Know Whether Sabotage Pays", *Journal of Regulatory Economics*, 17(2), 157-172.

Mandy, D. M. (2001), "Price And Vertical Control Policies For A Vertically Integrated Upstream Monopolist When Sabotage Is Costly", University of Missouri Working Paper.

Nalebuff, B. (1999), "Bundling as an Entry Barrier", mimeo.

Nalebuff, B. (2000), "Competing Against Bundles" in *Incentives, Organization and Public Economics*, P. Hammond and G. Myles (eds.), OUP, Oxford.

OECD (2003), "The benefits and costs of structural separation of the local loop", DSTI/ICCP/TISP (2002) 13/FINAL.

Ofcom (2004), Strategic Review Telecommunications Phase 2 consultation document, available at http://www.ofcom.org.uk/consult/condocs/telecoms_p2/.

Office of Communications (Ofcom) (2005), *A Notice under Section 155(1) of the Enterprise Act 2002*, available at <http://www.ofcom.org.uk/consult/condocs/sec155/>.

Ofcom (2006a), *Survey of BT's wholesale customers*, April

Ofcom (2006b), *Report on the implementation of BT's Undertakings*, May

Office of Fair Trading (OFT) (2004), *Assessment of conduct - Draft competition law guidelines for consultation*, OFT414a.

Posner, R. (2001), *Antitrust Law*, Second Edition, University of Chicago Press, Chicago and London.

Reiffen, D. & Ward, M.R. (2002), "Recent Empirical Evidence on Discrimination by Regulated firms", *Review of Network Economics*, March, available at http://www.rnejournal.com/abstract_reiffen.html.

Sand, J. Y. (2003), "Regulation and Foreclosure", NCFE Working Paper Series in Economics and Management, No. 09/03.

Sappington, D. E. M. & Weisman, D. L. (2005), "Self-Sabotage", *Journal of Regulatory Economics*, 27(2), 155-175.

Schmalensee, R. (1981), 'Output and Welfare Implications of Monopolistic Third Degree Price Discrimination', *American Economic Review*, 71, 241-247.

Sibley, D. & Weisman, D. (1998b), "Raising Rivals' Costs: The Entry of an Upstream Monopolist into Downstream Markets", *Information Economics and Policy*, 10, 451-470.

Sutton, J. (1991), *Sunk Costs and Market Structure*, MIT Press.

Valletti, T. (2003), "Input price Discrimination with Downstream Cournot Competitors", *International Journal of Industrial Organization*, 21, 969-987.

Varian, H.R. (1985), 'Price Discrimination and Social Welfare', *American Economic Review*, 75, 870-875.

Yoshida, Y. (2000), "Third-degree Price Discrimination in Input Markets: Output and Welfare", *American Economic Review*, 90, 240-246.

Weisman, D. (1999), "Vertical Integration and Exclusionary Behaviour in Network Industries", mimeo, Presented at the Rutgers University 12th Annual Western Conference, San Diego, California.