

# The Practice of Access Pricing

## Telecommunications in the United Kingdom

*Tommaso M. Valletti*

How regulation has evolved in the United Kingdom, with an emphasis on how telecommunication regulators determine access (interconnection) charges.



## Summary findings

Telecommunications was the first network utility to be privatized in the United Kingdom. Drawing on 15 years' experience and discussion in the field, Valletti shows the economic principles of regulation in general and access pricing in particular that have been implemented.

British Telecommunications (BT), formed as a public enterprise in 1980–81, was privatized in 1984. Since then the approaches to regulation have changed in three broad periods: the duopoly, the transition to competition, and the recently introduced normalization phase.

Dealing with each period, Valletti focuses on how the *actual* implementation of access charges are determined, at the same time providing background needed on regulatory intervention generally.

Rather than follow the model of competition for a common infrastructure, Oftel has encouraged competition between alternative networks, which benefits customers but involves duplication of fixed costs. As a result of Oftel's approach, consumers have seen their bills reduced 50 percent in real terms since privatization.

It is difficult to know how much to attribute this remarkable result to technological progress (BT halved its workforce in the same period), to regulatory

intervention (Oftel set string caps until 1997), or to competition (there are hundreds of players in the market). Valletti contends more weight should probably be given to the first two.

Entrants have not achieved big market shares, if one considers the asymmetric regulation that has been in place for more than a decade. Indirectly, at least, competition benefited consumers by applying discipline to BT's behavior.

Oftel's approach was interventionist until 1997, when it began trying to normalize the industry, as authority overseeing competition. The odds on complete deregulation are slight, and some controls on industry will remain.

In the longer term, Oftel should especially monitor anticompetitive practices and collusive behavior among the bigger players (BT, CWC, and cellulator operators).

The United Kingdom's interconnection experience demonstrates the complexity of the problem and its relationship to other topics, such as tariff rebalancing, access deficit, and universal service. Although a bit ad hoc, the recent incentive regulation, with a network cap based on proper accounting procedures and engineering models, may represent the best practice available today in the telecommunications industry, says Valletti.

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This paper — a product of the Regulatory Reform and Private Enterprise Group, Economic Development Institute — is part of a larger effort in the institute to increase understanding of infrastructure regulation. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Gabriela Chenet-Smith, room G2-148, telephone 202-473-6370, fax 202-334-8350, Internet address [gchenet@worldbank.org](mailto:gchenet@worldbank.org). Policy Research Working Papers are also posted on the Web at <http://www.worldbank.org/html/dec/Publications/Workpapers/home.html>. The author may be contacted at [t.valletti@lse.ac.uk](mailto:t.valletti@lse.ac.uk). February 1999. (24 pages)

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# **The practice of access pricing: Telecommunications in the United Kingdom**

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## 1. Introduction

In the UK, telecommunications was the first network utility to be privatised. The experience and wide-range discussions accumulated in 15 years, provide an excellent field to test the economic principles of regulation in general, and access pricing in particular. British Telecommunications (BT) was first formed as a public enterprise in 1980/81, and then privatised in 1984. Since then, the regulator has followed different approaches that can fall quite neatly into three phases: the duopoly period, a period of transition to competition, and a normalisation phase that has just been introduced.<sup>1</sup>

This paper deals with each period and it concentrates the discussion on the determination of *access charges*. Since it is impossible and possibly misleading to consider access issues without referring to the context into which they were developed, we will also provide a background on the more general regulatory intervention adopted.<sup>2</sup> This will not only clarify some properties of the various approaches, but it will also confirm that the access pricing problem is crucial for the development of effective competition and as such cannot be studied in isolation.

## 2. The duopoly period (1984-1991)

At the time of privatisation, the UK Government committed itself to license a single entrant, Mercury, to compete with BT. The incumbent was left intact as a vertically integrated network operator and service provider since it was thought that the limited dimensions of the British market did not justify a break-up policy similar to that adopted for AT&T in the US. The position of Director General of Telecommunications (DGT) was created to regulate the industry. The DGT heads the Office of Telecommunications (OfTel) and has the authority to issue orders which are enforceable in UK courts. If the DGT and a license holder cannot agree on license amendments, then the Monopolies and Mergers Commission acts as an arbiter.

Mercury's license was granted in 1982, although it started operations only in 1985. At the same time, the first cable television franchises were awarded, but the duopoly policy prohibited them, as well as other operator, from offering fixed telephony services until 1991. A similar duopoly policy was also followed for cellular services with two licenses awarded to Cellnet (partly owned by BT) and Vodafone (see Valletti and Cave, 1998). In return for its protection, Mercury undertook some mild obligations to expand its network. The strategy of the entrant quickly appeared to be to connect directly only a limited number of large business users, and to attract smaller users to its network for long distance and international calls, thus requiring access to BT's local loop.

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<sup>1</sup> See Beesley (1995) for the initial period; Armstrong *et al.* (1994) for the transition to competition; Armstrong (1997) and Cave (1997a) for more recent events.

<sup>2</sup> Annex 1 contains some general statistics that are commented in the main text.

The results from direct competition were a bit disappointing. Mercury did not fight for market shares, with the exception of small profitable segments. The discipline was rather imposed by the price control. RPI -  $X$  price cap regulation was chosen for a weighted basket of services (weights are calculated by the previous year's revenue shares from the various products).  $X$  was initially set at 3% for a period of five years. An important exception was made for line rentals. Although they were perceived to be below costs, the incumbent was required not to increase them by more than RPI + 2% in any year. Finally, BT had to provide similar services at geographically uniform prices.

In 1989 a new price control set the  $X$  factor to 4.5% for a period of four years, and at the same time the basket of regulated services was broadened. The separate cap on domestic rental charges was kept and extended to include business line rentals and connection charges. The regulator - concerned about unevenly spread benefits from competition - also asked BT to introduce low-user schemes.

## **2.1 Rebalancing of call charges**

Immediately after privatisation, it appeared clear that large cross-subsidies existed from long-distance to local calls. BT had also inherited low rental charges, reflecting the typical promotion of telecommunications among residential users.<sup>3</sup> The incumbent asked permission to rebalance its charges, on the basis that they were not in line with costs. However, the regulator feared that rebalancing could on the one hand be unacceptable for low-income families and rural areas and, on the other hand, undermine the liberalisation process (BT could in fact rebalance its tariffs only on the segments it expected competition from Mercury).

In the end, the separate cap of RPI + 2% on line rentals represented a sort of compromise, giving the freedom to achieve some degree of rebalancing, subject to non-discrimination among similar categories of users all over the country. This choice supplied Mercury with sufficient oxygen to make inroads into the market, but it also created a new policy dilemma. The incumbent could in fact claim it had a serious access deficit, resulting from public service obligations and from the fixed costs of the local loop that could not be covered by constrained rentals. While there was general consensus that these losses had to be partly recouped by call charges, the exact methodology turned out to be very controversial.

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<sup>3</sup> This aspect is a feature common to many countries and it often derives from political pressures to contain prices to consumers. From an economic viewpoint, it was justified in the past to expand telephony services at a fast rate in order to benefit from positive network externalities when many customers are connected. However, once the subscriber base is near to its saturation level, then the externality effect becomes relatively small, providing a rationale for abandoning such a subsidy. Note that the argument therefore applies to developed markets with high penetration rates and not necessarily to developing countries.

## 2.2 The 1985 determination

Some years after its launch, Mercury was able to gain reasonable shares in terms of revenue. However, BT controlled virtually all the subscribers' lines. Hence it is clear that the terms of interconnection were crucial for Mercury, since every call was either initiated or terminated (or both) on BT's network. The UK regulatory regime specifies that parties are free to seek an interconnection agreement on a commercial basis. If that fails, then Oftel can intervene to determine interconnection prices. In general, agreements are likely to be found when parties mutually benefit from interconnection while agreements are bound to fail when there are divergent interests (see Valletti and Estache, 1998). The intuition is simple: if two parties – A and B – can create a “big pie” by finding an agreement, bigger than any “pie” they can create independently, then they will be able to get each a sufficiently big slice, the share depending on the relative bargaining power. On the other hand if the “pie” is of fixed size, then interconnection cannot increase it, but it simply redistributes rents and it produces a tension: the more party A gets, the less party B receives and vice versa. Such a contrast is difficult to be resolved.

The predictions of the theory were observed in practice. BT and Mercury were not in stark contrasts with the mobile services that were being successfully launched in the same period. Mobile and fixed services in the early period were not close substitutes to each other, so that interconnection could provide a market expansion (the “bigger pie”) beneficial to both parties and interconnection agreements were easily found. On the other hand, there were opposite incentives for the interconnection between BT and Mercury: without any substantial innovation the two services would have been almost identical (the “fixed pie”) and each customer subscribing to Mercury would have represented a customer lost for BT. Not surprisingly, agreements between BT and Mercury failed and Oftel was called in to determine the charges in 1985, so that Mercury could enter the fixed telephony market.

BT had in its license a condition that *allowed the access charge to cover the costs of providing interconnection, including relevant overheads and a reasonable rate of return on the relevant assets on the basis of fully distributed costs (FDC) calculated on a historic basis.* Despite sounding reasonable, the previous precepts are too vague without any further qualification. Oftel, however, did not provide detailed explanation of its methodology. Oftel ruled Mercury to pay for all the *direct costs* of providing access (labour, laying cable, altering exchanges, etc.) and a *per-minute charge* for the use of the local network, this charge varying with the time of the day (cheap/standard/peak rate) and with the distance of the delivery (local/short national/long national).<sup>4</sup> After the initial determination, the charges would be indexed over time according to RPI – 3%, unless parties requested a new determination. The exact method used to determine the charges was not made public, but it was clear that they *did not include any contribution to BT's access deficit in order to assist the new entrant.*

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<sup>4</sup> See Annex 2 for details.

One of the reasons for not giving detailed explanations about the determination, was that Oftel feared that parties could then appeal for judicial review on specific issues, leading to a further and embarrassing delay. At the same time, some barriers to entry existed for Mercury, most notably its subscribers had to use a special and expensive telephone (with a “blue button”) to access the entrant’s long-distance services. This can explain in part why initial charges were believed to be pretty much in Mercury’s favour. In practice, access charges were felt by all commentators as being *discounts on the incumbent’s retail prices thus providing a signal to the entrant about the profitability of entry in different segment*. Remember that BT was quite constrained on its pricing policy: rentals were still cheap and could not be increased sharply. Hence BT could not decrease too much its long-distance prices in order to break even. As a result, Mercury did not find it convenient to enter in the local loop (where it could obtain access to BT’s network at a fairly low charge) while a good margin was available for investments in a long-distance network. The effect of Oftel’s policy was then set to provide incentives to build a trunk network (see Armstrong and Doyle, 1998).

#### **Summary: the duopoly phase**

- In the duopoly phase (1984-1991), asymmetric regulation was in place. The incumbent was constrained in the rebalancing of its tariffs (line rentals in particular).
- Private agreements between BT and Mercury over access charges failed and the regulator had to intervene.
- The details of the interconnection determination were not made public, but they probably took into account Mercury’s disadvantages. Although BT’s license contained some guidelines (FDC), in practice the desire to promote competition prevailed over all other issues.
- Access charges performed a signalling function. Access charges were perceived as being based on the incumbent’s prices so as to ensure Mercury’s viability in some segments.

### **3. Transition to competition (1991-1997)**

In 1991, the duopoly review initiated major structural changes and the market was opened to many additional network entrants. Most notably, entrants included cable television (CaTV) operators and other utilities companies. While the latter could build telecommunications facilities around their existing networks,<sup>5</sup> the former benefited from scope economies between broadcasting and telecommunications services. The principle to assist entry that had been applied to Mercury for its seven protected years, was also followed for cable operators. While cable networks could offer telecommunications services, PTOs could not offer entertainment TV services. The reason was once again to assist entry, in particular into local markets, something that Mercury did not succeed (before April 1997 Mercury had virtually no residential subscriber *directly* connected). Note that CaTV operators only lay cable in the local area, so they need interconnection for trunk services.<sup>6</sup>

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<sup>5</sup> Energis has established a network built on the high voltage electricity transmission grid. Other entrants include British Rail and British Waterways.

<sup>6</sup> A crucial move for the expansion of the cable market was also to allow foreign investors (mostly North American) to bid for the franchises. Since 1991 the cable TV market has been growing quite rapidly. At April 1997, 2.5 million

The Government awarded licenses in virtually all markets, including two new licenses for personal communication mobile services (PCS). The duopoly policy was still retained for international calls, although some competition was gradually put in place by first allowing simple resale of international leased lines, then opening up the field in mid 1996. More than 150 licenses have been awarded so far, but one has to be very careful with these numbers, since many operators are in small niches and, despite entry assistance, at the end of 1997 BT still accounted for nearly 90% of all fixed exchange lines. The duopoly review brought the *X* factor down to 6.25% while the tariff basket was enlarged to include international calls. From 1993, for a period of four years, BT's retail prices were further tightened to RPI - 7.5%. The low-user scheme was extended to cover the quarter of BT's customer who used the telephone least. The standard connection charge for installation had to be reduced by 40% to £99, implying some losses to BT in rural areas. In order to fight predatory behaviour, it was also decided not to count quantity discounts (optional tariffs) toward the calculation of the price index.

In summary, in the first decade of price-cap regulation, *the regulatory process became more public* (with an extensive use of consultation documents), and, at the same time, *more pervasive and stringent*. By going into the details of how caps are determined, it can also be recognised that the mechanism has still the flavour of rate-of-return regulation. With so many new operators with small networks, it was obvious that the 1991 duopoly review brought the issue of interconnection again to the centre of the public debate. Recall that the 1985's determination, originally in Mercury's favour, constrained access charges to fall according to a RPI - 3% formula. This was in contrast with the much faster rate of decline in retail prices, so that by 1991, they indexation made them rather generous for BT. BT and Mercury could not agree on a revision of charges, and in 1992 the parties asked the DGT to reassess conditions of their earlier agreement. Contrary to 7 years earlier, interconnection had a big and rather open debate. The determination concentrated on conveyance charges and was published in December 1993 (see Annex 3 for details).

The determination was not meant to be a definite solution, and a period of extensive discussion and consultation followed. In early 1994, a three-stage program on accounting separation and interconnection was started. The first stage used the last determination as a basis for interim charges for other operators. The second stage separated BT accounts to have a more transparent process. This also allowed to implement a new list of services and corresponding charges. The final stage discussed several issues, including cost bases alternative to historic costs, and possible future directions. The outcome led to the recent revision of 1997.

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lines were installed (22% penetration), with 9 million premises passed. Originally, more than 100 franchises were awarded, but since then the market has considerably consolidated. In April 1997, three of the biggest cable companies, Bell Cablemedia, Nynex CableComm and Videotron, merged with Mercury to create Cable&Wireless Communications (CWC).

### 3.1 Access deficit contributions

According to BT's initial license and successive amendments, interconnection charges had to be calculated around three elements: a) the fully-distributed cost (FDC) of conveyance calculated on a historic-cost basis (HCA), b) the applicable rate of return on the relevant capital employed, finally c) an access deficit contribution (ADC). The ADC intended to take into account the losses which BT suffered for being unable to raise its line rentals. For instance, in the fiscal year 1992/93, BT's profitability by service, using FDC on a HCA basis was as follows:

Service:	Access	Inland calls	International calls	Total group
ROCE (%)	-9	+45	+53	+18

BT had to face regulatory constraints that were onerous for the incumbent: capped prices, low rentals and social obligations had to be funded in some way. The rationale behind ADC was precisely to recover through call charges connection and rental charges that were below their costs.<sup>7</sup>

Entrants clearly targeted the most profitable segments. Since interconnection deprived the incumbent from such extra revenues, interconnectors were supposed to compensate the opportunity cost of foregone profits to BT on a per-minute basis. These *contributions were set proportional to BT's profitability of the service provided by the competitor*. It is clear that the formula used by OfTel was influenced by the debate introduced by the efficient component pricing rule (ECPR): ADC compensates for profits foregone by selling to competing operators instead of selling directly to consumers.<sup>8</sup>

Despite the specification of procedures, a fair amount of discretion was left to the regulator, so that ADC did not play a big role in practice. First of all, the DGT could decide which were the relevant overheads over which a "fair" return could be earned (incidentally, note how the process is reminiscent of cost-plus regulation). In second place, the DGT could also issue waivers (full or partial). The waiver criteria, valid until 1997, applied to market shares of at most 10% and as long as BT's share in the market in question did not fall below 85%. Full ADC had to be paid only if an interconnector's market share exceeded 25%. Additional discretion was added since ADC could be lowered if BT did not achieve benchmark efficiency (using US data from RBOC). In practical terms, ADC had to be paid in a few years only for international calls.

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<sup>7</sup> One can in principle distinguish between an *access deficit*, due to unbalanced tariffs when rental and connection costs exceed the corresponding charges, and an *universal service deficit*, due to geographically averaged tariffs and uneconomical subscribers. Without a proper accounting system, these two types of deficits are difficult to distinguish. In the initial phase, they were practically pooled together, giving rise to BT's deficit.

<sup>8</sup> See Annex 3 for practical details. A discussion of ECPR can be found in Valletti and Estache (1998), section 3.2.

In summary, ADC had many merits. It was inspired by the theoretical debate (ECPR in particular) and it generated a high-profile debate. The concept of an access deficit was developed for the first time and Oftel tried to make it workable. In practice, waivers made it uncertain and its effectiveness was diminished if not eliminated. The whole idea of contributions to access deficits was abandoned in early 1996 when the RPI + 2% constraint on BT's rental charges was abolished. After 10 years of tariff rebalancing, the access deficit was eliminated and the deficit caused by Universal Service Obligations was decided to be tackled independently.

### **3.2 Unbundling and accounting separation**

The 1993 determination, not only set interconnection charges for Mercury, but it also provided a sort of standard list of interconnection services that could be used by other entrants. This list was deemed important as a signal for new operators, and Oftel decided to further unbundle BT's services, so that interconnecting operators could just buy those services which they required. A standard list for about 60 unbundled wholesale services was published. The trade-off involved with unbundling is evident: it can foster competition as long as it reduces the entrant's expenditure on access services, but it also requires complicated accounting procedures to allocate joint costs. Moreover, unbundling does not promote entrants' investments in the local loop since they can rely on the incumbent's assets.

It was generally agreed that something had to be done to deal with the rather arbitrary use of fully allocated costs on a historic cost accounting basis. The task to overcome these deficiencies, was given to an industry working group (see the next section). Unbundled services could also perform an additional role on top of sending signals to entrants. They could be used to detect potentially anti-competitive behaviour of the incumbent. Since 1994/95 BT was required to publish separate accounts of its activities, divided into access, network and retail functions.<sup>9</sup> *Accounting separation* had the double purpose - still undermined by the accounting conventions used - to allocate costs in a way that should reflect the division between activities and demonstrate using audited financial statements that BT was not engaging in unduly discriminatory behaviour. The last purpose was implemented using an *imputation principle*: BT (network) should charge itself the same conveyance rate as it charges to other operators purchasing the same service on an interconnection basis.

### **3.3 Determination of Long Run Incremental Costs**

Independently from the recovery of fixed costs, a key element for the determination of access charges is the incremental cost caused by the provision of additional output. Oftel recognised that the system in use (FDC using the HCA convention) was not satisfactory and two alternative cost methodologies were adopted to calculate long run incremental costs (LRIC). Since LRIC is a

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<sup>9</sup> BT network includes all services offered both to interconnectors and BT retail. BT access includes costs, capital employed and revenues from installation, line rental and other access services to the public switched telephone market. BT retail is separated further into regulated and nonregulated services categories.

forward looking concept, the basis for the valuation of an asset should be current cost accounting (CCA). CCA evaluates the replacement cost of an asset with the lowest cost asset which serves the same function (this is called modern equivalent asset, and it should incorporate the latest technology available), rather than the historic cost at the purchase time followed by HCA.

An historical accounting basis may distort decisions when technology is evolving rapidly. Moreover, inefficient past decisions will have effects on future choices if a HCA basis is adopted. Take the example of the replacement of BT's ducts: the current cost is likely to exceed the historic cost. The reverse is true for switches costs. If access prices are calculated with HCA, then inefficient entrants may enter access services and efficient firms may not find it convenient to enter into conveyance. On the other hand, a CCA basis sends signals to all players that reflect current market conditions and therefore a CCA basis is helpful both to the incumbent and to the entrants in their investment and pricing decisions.

Despite its flaws, HCA is deeply rooted into many firms' accounting systems and it may be the only option available before better accounting procedures are introduced. Oftel, anticipating that it would have taken time to switch between the systems, decided to keep the old one in place while working on two interrelated projects. One methodology, known as "top-down", was developed by BT to estimate the incremental cost of different network components in both historic and current cost terms, starting from BT's management and financial accounting data. The other model, based on a "bottom-up" methodology, involved the construction of an engineering model of the plants and other parts needed to provide an inland Public Switched Telephone Network.

The bottom-up model attempts to determine the cost of network with a topology similar to BT's existing network, and to compute the average incremental cost of providing a particular service. The model is rather simple and transparent and it explicitly focuses on the parameters that drive network dimensioning. The top-down model contains a large number of categories of costs, each one with one or more cost drivers and a cost-volume relationship. Its strength is to examine costs in a highly disaggregated and articulated way, so that, if correctly specified, it can provide a picture of the way in which output levels drive individual costs. However, both models also present weaknesses, for instance the top-down approach is strongly influenced by accounting conventions, while the engineering models are often not enough articulated. In addition, the models use different ways to calculate several factors.<sup>10</sup>

In the end, the models produced different estimates for the same interconnection service, and a subsequent attempt was made to integrate and reconcile the two approaches. What is relevant to our discussion, is that the process lead to a *gradual shift toward better accounting*

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<sup>10</sup> For instance, the bottom-up model calculates operating costs that reflect the international experience of a range of operators, rather than BT's experience alone as implied by a top-down approach. Differences in utilisation or pricing can produce different capital equipment costs. Alternative depreciation profiles based respectively on economic and accounting depreciation can also give rise to conflicting results (see Cave, 1997b for a discussion).

*practices and a deeper understanding of cost causation and relationships.* In this way, most overheads can be directly attributed to services, without having to pool them together in a big category of common and joint costs. Some unattributed costs remain, however, from economies of scale and economies of scope between conveyance and access. Such remaining costs, that Oftel estimated in the order of 10% of the costs of the network, have to be apportioned. Oftel considered different options (incremental cost with or without equal mark-up, ECPR, ADC, Ramsey) and came up in favour of the use of equal proportionate mark ups. This principle is simple and practical, but it is not supported by any theory. It has to be said, however, that the magnitude of the problem is considerably reduced by the detailed allocation procedure. At the same time, Oftel also clearly stated that it did not favour using interconnection charges to promote entry, rather it wanted to tackle barriers to entry directly.<sup>11</sup>

The methodology to calculate incremental costs also provided a system of guideline ceilings and floors that can be used to retain some regulatory control in case the incumbent is given more freedom to set the structure of interconnection charges. A system of ceilings (normally represented by the stand-alone cost) is intended to prevent BT from exploiting its market power by setting excessively high interconnection prices. On the other hand, a system of floors (normally given by the incremental cost) can be used to monitor against aggressive pricing with a predatory intent.

#### **Summary: the transition phase**

- In the transition stage to competition (1991-1997), regulatory policy became one of encouraging (asymmetric) competition in the local loop, despite the additional infrastructure investment.
- The regulation process became more public, and, at the same time, more pervasive and stringent. Interconnection issues were left to private negotiations between parties involved, but the regulator still intervened for all major determinations.
- At the beginning of the period, ADCs provided a practical way of implementing ECPR, however, DGT's discretion undermined the mechanism. Over time, access charges had to perform less tasks, thanks to the removal of constraints on rental charges and to separate approaches to specific issues (number portability, USO).
- With accounting separation and unbundling, the access problem shifted from interconnection prices between competing operators to the setting of network wholesale prices. A list of network services could provide transparency for new entrants. In order for this list to send undistorted signals, more consistent accounting practices were gradually introduced.

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<sup>11</sup> A relevant entry barrier exists when *number portability* is not available. Number portability is a source of customer inertia which implies that entrants find it more difficult to attract customers. When the latter cannot keep their telephone number, they have to incur costs that can be substantial for some users (print new paper, inform business partners and clients, etc.). The absence of number portability is an example of switching costs that put a new entrant at a disadvantage. Oftel decided that portability had to be provided by operators from 1998 and it separated the problem from the more general category of interconnection charges (a specific methodology was developed to apportionate network costs caused by portability provision). Similarly, financial burdens arising from universal service obligations were discussed separately (see section 4.2).

#### **4. Normalisation (1997-2001)**

The new price review of 1997 marks a big shift in the approach followed by Oftel. The DGT has made it clear that his aim is to pull back from regulation as competition advances, and to ensure that fair competition takes place. Oftel, reversing the previous trends of detailed and prescriptive regulation, has taken large steps towards being a fair trade authority. This is supposed to be the last retail price control, which should end in 2001.

The new retail cap has been reduced by two thirds, covering services provided to a sub-set of BT's customers that are not likely to benefit from competition. In particular, the new cap regime constraints the average bill of the 80% of residential customers who use the telephone least ( $X$  being fixed at 4.5%).<sup>12</sup> BT is also still constrained to charge geographically uniform prices for all its services. The greater flexibility of behaviour granted to BT may leave potential for abuse of its dominant position by charging high prices or engaging in anti-competitive practices against its competitors. Oftel has then introduced a controversial "*Fair Trading Condition*" (FTC) that gives the regulator powers to deal with anti-competitive behaviour, based along the lines specified by Articles 85 and 86 of the EC Treaty of Rome.

Oftel is trying to replace its prescriptive approach with a proscriptive one. In a market in constant evolution like the telecommunications market, detailed regulation based on clauses contained in each operator's license has the risk of becoming too complex and not in line with technological developments. The FTC gives the regulator the discretion to intervene quickly when firms engage in anticompetitive practices. The higher degree of discretion, however, may not provide sufficiently clear guidelines to the operators and for this reason Oftel is now promoting a debate on the its new role and on the overlap of jurisdictions with other anti-trust bodies.<sup>13</sup>

##### **4.1 The network price cap**

The system of access charges until 1997 was based on rate-of-return regulation. A part from accounting issues and the allocation of common costs, the published list of BT's services did not

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<sup>12</sup> This value has to be compared with the yearly average reduction of 2.7% for the same category of users in the period 1990/91-1995/96 (in the same period the average reduction for business users was 9.3%).

<sup>13</sup> The new UK Competition Bill, recently approved by the Parliament in October 1997, proposes major changes in general competition law. Like the FTC, the Competition Bill introduces two prohibitions based on Articles 85 and 86 of the EC Treaty; namely a prohibition on the abuse of a dominant position and a prohibition on anti-competitive agreements. The DGT will have concurrent powers of enforcement alongside the Director General of Fair Trading. The Bill provides for new investigatory powers and permits the imposition of fines for breach of the prohibitions. The new prohibitions will come into force on 1 Mar 2000 and there will be a one-year transitional period. European telecommunications liberalisation is another strong external influence on Oftel. Because of both technical and market convergence of the broadcasting, telecoms and IT sectors, it becomes possible to deliver similar services over what were previously distinct networks. The European Commission has recently published a Green Paper on convergence and in 1999 the EU will review the overall regulatory framework. In general, the new EC Directives give Oftel significant implementation responsibilities.

give incentives to reduce costs, although the cap on retail prices mitigated the problem. In general and probably more important, a detailed control of each interconnection service is a very intrusive and time-consuming process. The determination of each access price by the regulator is also subject to a certain degree of arbitrariness, as it can be easily argued about the decision to favour equal mark-ups to distribute common costs. These deficiencies can be removed by relying instead on caps to control network charges.

The new arrangements, in place from October 1997, give BT flexibility to set charges within a framework of network caps and other rules. As with any other cap mechanism (see Green and Rodriguez-Pardina, 1998), key parameters set by Oftel include:

- the level of the charges for interconnection at the beginning of the period;
- the percentage reduction in real terms in each year ( $X$ );
- the coverage of the cap and the weights of each service within the cap;
- the duration of the control (four years until September 2001).

Oftel developed a sort of “effective competition matrix”, to investigate the degree of competition in different markets, recognising that the need for regulation is inversely related with the degree of competition. Three main areas are identified: competitive services, prospectively competitive services, bottleneck and non-competitive services:

- *Competitive services* are those where a high degree of competition already exists or without barriers of any sort to entrants. Competitive services are outside of network control and BT is free to set its charges. In practical terms, only operator assistance services belong to this category.
- *Prospectively competitive services* are those that are not competitive by the time of the introduction of the new regime, but are expected to become competitive during the control period. These services are regulated by safeguard caps ( $RPI + 0\%$ ), so that initial charges will not raise. If during the control period services become competitive, then also the safeguard will be removed. The issue here is that if such services are put in the main basket, then BT could engage into predatory practices, concentrating price reductions only in areas where it faces some rivals and keeping high prices in other areas. Services included in this category are inter-tandem conveyance and transit, international direct dial conveyance, international private leased circuits, directory enquires services, access to emergency services.
- For *bottleneck and non-competitive services*, three separate baskets are capped by the familiar  $RPI - X$  mechanism. These are services that are not likely to be subject to a relevant degree of competition during the control period. The productivity  $X$  factor is fixed at 8% for a four-year period for all three baskets which cover roughly half of BT’s network activities. The three baskets are respectively *call termination* services (local exchange segment), *general network* services (call origination, local-tandem conveyance, single transit), and *connection* services (interconnection circuits). The main reason for having three separate baskets, is the fear that BT may recover an excessive proportion of its costs from call termination, which is very likely to remain the main bottleneck in place in the future. It should be mentioned that from

1999 there will be an additional basket subject to RPI – 8% to deal with number portability costs.

In terms of the size of the market segments, bottleneck and non-competitive services are definitely the most important ones and very little competition is at the moment taking place at the network level. Within each cap, individual services are subject to a system of floors and ceilings based respectively on incremental costs and stand alone costs of an efficient operator. The weights of each service included in the cap are given by their relative revenue shares in the basket in the previous financial year. Revenues are calculated for the accounts of BT network, hence they include purchases from BT retail as well as from other operators. The starting levels of charges in the baskets are based on forward-looking LRIC with equal mark-ups using the bottom-up and top-down methodologies discussed section 3.3.

## 4.2 Universal service

In this section, we analyse another regulatory development that has traditionally affected access pricing consideration: *Universal Service Obligation* (USO). Considerations on USO typically involve two classes of problems: its definition and the mechanism for its funding. Until the year 2001, with a possible review in 1999, the level of universal service consists of:

- a connection to the fixed network able to support voice telephony and low speed data and fax transmission;
- the option of a restricted package at a low cost;<sup>14</sup>
- reasonable access to public call boxes;
- free access to emergency services and access to operator assistance and directory information;
- the option for customers to chose an outgoing calls barred service together with a repayment plan, as an alternative to disconnection;
- the provision of services at geographically averaged prices.

Note that access to Internet services is not included in the definition of universal service. This is because Oftel believes that the idea of universal service should not be used to promote new technologies. The problem of access to Internet for schools, as wells as telephony services for disabled people, is tackled separately from USO. BT is the only operator that has an obligation to universal service. With the end on the limitation of rebalancing, the entity of the problem has been considerably reduced and the main burden arises now from the nationally averaged tariffs and uneconomic customers. Oftel computed that USO costs (losses from those subscribers whose avoidable costs exceed their avoidable revenue - including revenue from incoming calls) were less than £100 million in 1997 (about 0.5% of sector turnover).

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<sup>14</sup> In 1997, 2.5 million BT's users were subscribers of a light-user scheme. Oftel estimated that 1 more million people would like to have a telephone but cannot afford it given existing low-cost packages.

Oftel first decided that USO costs be funded by all operators, on the basis of indicators like revenue shares. However, the limited entity of the burden subsequently convinced the regulator that there is no need, for the moment, to establish a fund because USO gives BT some benefits that outweigh the direct costs.<sup>15</sup> In any case, the idea of a fund has not been dismissed and it may become relevant in the future. If that occurs, payments from the fund should be made to whichever firm incurs costs in providing social obligations, which basically means BT although in the future other operators may bid for subsidies from the fund to meet universal service obligations.

### 4.3 Assessment of recent changes and controversial issues

The implementation of the current regime is too recent to give an *ex-post* assessment. What can be said, is that the current approach is part of a broader strategy of deregulation of the industry, completing the process of entry liberalisation and attempting to eliminate some constraints on BT. The principles of incentive regulation, successfully experimented with the price-cap mechanism on final users' tariffs have finally been applied to network services, partially replacing the previous cost-plus approach. Flexibility is desirable because the operator is better placed than the regulator to set relative prices that can achieve a higher degree of efficiency. The other side of flexibility is the danger of anti-competitive behaviour, and this is why Oftel has adopted a monitoring system of floors and ceiling and it has introduced the FTC clause.

Very little is known about the properties of the dual system of partial caps that Oftel has adopted. According to economic theory, the desirable mechanism is a global price-cap: all the goods and services, be they intermediate or final, should be included in the basket. Oftel's approach is very *ad hoc*, separating the partial cap for residential users from the more complicated system of network caps. The latter in particular still poses considerable constraints on the incumbent operator.

The concept of forward-looking LRIC, used to set initial levels, also creates some tensions with respect to investments in the long run. If the incumbent operator anticipates that it cannot obtain extra-rents from its investment in infrastructure, it will become more reluctant to upgrade its network. The same observation applies to the relatively low cost of capital that Oftel is applying in its calculations (12.5%) to determine BT's charges. Moreover, the determination of LRIC still leaves considerable discretion in its calculation.

Another controversial issue is that usage-dependent pricing is not permitted to BT. The same interconnection service has to be charged at the same rate, independently of the nature of the final service supplied. This implies that demand conditions are not taken into consideration when setting interconnection charges, and this is in contrast with insights derived from economic theory. It is true that it is difficult to have information about demand, but one cannot conclude

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<sup>15</sup> Benefits include rather cloudy concepts such as brand enhancement, ubiquity and life-cycle effects (an uneconomic customer can become a more profitable BT's customer in the future).

that the only option are charges purely based on costs plus an equal mark up. As an example, BT has to offer mobile operators the same conditions it offers to other operators when they terminate their calls on BT's network and the access charge BT can ask is regulated. On the other hand, when calls are originated on BT's network and terminated on a mobile network, then the termination charge that the mobile operator requires is not regulated. To provide rough figures, in the quarter July-September 1997, BT terminated a volume of 1,629 million minutes originated by mobile users, receiving an average revenue of 1.4 p/min. In the same period, BT originated 907 million minutes of calls destined to mobile users and it had to pay an average termination charge of 17.3 p/min. It is true that origination and termination involve different costs, however the discrepancy is so high that Oftel asked the Monopolies and Mergers Commission to conduct a full investigation that is still under its way. On top of the obvious question of unregulated charges set by operators with market power other than BT (the mobile operators in the example provided), the case also illustrates the following point. If demand to and from mobile users is not very price sensitive, why should BT not cover a higher portion of its fixed costs on that segment via higher access charges, thus allowing for price reductions in more price responsive segments?

Finally, the regulator is encouraging private negotiations and it generally does not intervene if parties are able to reach an agreement. In a context with just a handful of relevant operators, it is not clear that a successful agreement indicates that an efficient outcome is achieved. Two parties might collude on the setting of access charges in order to fix high final prices to their subscribers. The previous example on the mobile termination charges is an illustration of the potential dangers arising from the unregulated setting of access charges in the presence of market power. Oftel is promoting the idea of *reciprocity*, i.e. what operator A charges operator B for access to its own network has to be the same operator B charges A for access to the other network. Reciprocity, however, is a good mechanism to sustain collusive deals aiming at price fixing. The best possible example can be probably derived from international accounting rates. The settlements agreed upon by two operators in different countries typically involve high access charges that in the end push up retail prices. The high access prices do not seem to be justified on a purely cost basis, rather operators co-ordinate in order to extract higher revenues from subscribers.

#### **Summary: the normalisation phase**

- In the normalisation phase (1997-2001), Oftel is seeking a less interventionist approach, mimicking a competition authority. Regulation of final prices focuses only on small users and it will end in 2001.
- Incentive regulation has been introduced also for interconnection services (the network price cap). The system adopted is still very *ad hoc* and it imposes considerable constraints on BT.
- Progressive deregulation brings the risk of collusive practices. Oftel will have to monitor also the behaviour of entrants.

## 5. Conclusions

This paper has described the evolution of regulation in the UK with an emphasis on interconnection charges. Oftel's approach has been successful for consumers that have benefited from a reduction of 50% of their bills in real terms since privatisation. However, it is more difficult to attribute this remarkable result either to technological progress (BT has halved its workforce in the same period), to regulatory intervention (Oftel has set stringent caps until 1997), or competition (there are hundreds of players in the market). The outcome is due to the three factors together, with more weight to be probably given to the first two. Entrants have not achieved big market shares if one thinks of the very asymmetric regulation that has been in place for more than a decade. Indirectly at least, competition did have a positive effect for consumers because it provided a disciplinary device on BT's behaviour.

Oftel has opted for a model of competition between alternative networks, rather than competition over a common infrastructure. The former can deliver a higher degree of direct competition for customers but it involves some duplication of fixed costs. Oftel's approach has been very interventionist until 1997, now it is seeking to normalise the industry acting as a competition authority. The prospects for a complete deregulation are small, and forms of control will remain in the industry. In particular, in the longer term Oftel should monitor not only anti-competitive practices but also potentially collusive behaviour among the bigger players (BT, CWC, cellular operators).

The interconnection experience in the UK provides an excellent opportunity to understand the complexity of the problem and its links with other important topics such as tariff rebalancing, access deficit and universal service. The recent incentive regulation introduced with a network cap based on proper accounting procedures and engineering models, despite being a bit *ad hoc*, probably represents the best practice available today in the telecommunications industry.

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## Annex 1. Summary statistics

Sources: OfTel, Market Information Update (May 1998) and Companies' Reports

Table 1.1. Performance of BT and Mercury

	1981/82	1984/85	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
<b>BT</b>									
Turnover (£ billion)	5.7	7.6	13.4	13.2	13.7	13.9	14.5	14.9	15.6
Employees (000s)	252	238	210	171	156	138	131	128	125
Lines (million)					26.6	27.1	27.3	27.6	27.7
<b>Mercury (CWC)</b>									
Turnover (£ billion)	-	-	0.9	1.2	1.5	1.7	1.8	1.7	2.3*
Employees (000s)	-	-	6	7	9	10	9	7	12*

Note: a) the fiscal year ends at 31/3. b) CWC was created with a merger on 28 April 1997. Figures \* from CWC include CaTV operators and cannot directly compare with earlier figures for Mercury.

Table 1.2. Fixed telephony services. Summary of market shares, Quarter 2 1997/98

	Total UK	BT	CWC	CATV	Others
<b>Revenues (quarter)</b>					
Local calls	£572 million	86%	6%	7%	1%
National calls	459	76	12	4	7
International calls	394	51	16	4	29
Calls to mobile	230	75	15	5	5
Other calls	352	86	9	3	2
<b>Total calls</b>	<b>2,007</b>	<b>76</b>	<b>10</b>	<b>5</b>	<b>9</b>
<b>Rental</b>	<b>775</b>	<b>91</b>	<b>4</b>	<b>4</b>	<b>1</b>
<b>Connection</b>	<b>62</b>	<b>90</b>	<b>3</b>	<b>5</b>	<b>2</b>
<b>Total revenues</b>	<b>2,844</b>	<b>80</b>	<b>8</b>	<b>5</b>	<b>7</b>
<b>Lines (at 30/9/98)</b>					
Business	8.17 million	90%	6%	2%	2%
Residential	22.87	88	4	8	0
<b>Total</b>	<b>31.04</b>	<b>89</b>	<b>4</b>	<b>6</b>	<b>1</b>

Table 1.3. Retail price control

Period	1984-89	1989-91	1991-93	1993-97	1997-2001
Price-cap	RPI-3%	RPI-4.5%	RPI-6.25%	RPI-7.5%	RPI-4.5%
Coverage	48-53%	55-56%	64-66%	64-67%	20% (forecast)

Table 1.4. Benefits from regulation. Change of BT's prices between 1984/85 and 1996/97

	Daytime 3' local call	Daytime 3' nat. call	Daytime 3' call to USA	Bus. line rental	Resid. Line rental
Change	-39%	-39% to -80%	-89%	+9%	+11%

Note: changes are in real terms, additional discounts are not included. The average decline for BT's basic services is 48%.

Table 1.5. Interconnection revenues and payments, Quarter 2 1997/98

	Total fixed operators	BT	CWC	Mobile operators
<b>Revenues</b>				
From UK fixed inland:				
Volume (million minutes)	10,977	6,161	2,078	
Payment received (£ million)	155	84	44	
Average (p/min)	1.4	1.4	2.1	
From incoming international:				
Volume (million minutes)	1,429	948	411	
Payment received (£ million)	190	116	69	
Average (p/min)	13.3	12.2	16.8	
From UK cellular:				
Volume (million minutes)	1,705	1,629	76	
Payment received (£ million)	24	23	1	
Average (p/min)	1.4	1.4	1.3	
<b>Total:</b>				
Volume (million minutes)	10,480	6,718	1,620	1,201*
Payment received (£ million)	468	249	146	191*
Average (p/min)	4.5	3.7	9.0	15.9*
<b>Costs</b>				
To UK fixed inland:				
Volume (million minutes)	11,822	5,096	2,899	
Payment received (£ million)	139	45	36	
Average (p/min)	1.2	0.9	1.2	
To outgoing international:				
Volume (million minutes)	1,622	879	539	
Payment (£ million)	243	137	75	
Average (p/min)	15.0	15.6	13.9	
To UK cellular:				
Volume (million minutes)	1,116	907	182	
Payment received (£ million)	191	157	29	
Average (p/min)	17.1	17.3	15.9	
<b>Total:</b>				
Volume (million minutes)	14,989	6,882	3,623	1,705*
Payment received (£ million)	658	340	141	24*
Average (p/min)	4.4	4.9	3.9	1.4*

\* Data for cellular operators are aggregated. However in the same period 95% of calls terminated on mobile networks were originated on fixed networks, and more than 80% of calls originated by mobile subscribers were terminated on fixed networks.

## Annex 2. The 1985 determination

BT and Mercury agreed on interconnection terms in 1986, based on the previous year determination made by the DGT. The determination established interconnection at the local (3L) and trunk (3J) levels, reflecting a difference typical of analogue networks. 3L is the normal form of subscriber access (the call is handed over at the local exchange), while 3J interconnects at the junction side of a trunk exchange to which the BT subscriber is connected. Under 3J BT's local loop is bypassed. Mercury has tried to employ 3J interconnections whenever technically possible.

The main points of the determination were:

- BT customers could choose to route long-distance calls via Mercury, or to terminate calls at Mercury destinations. Mercury could be able to reach destinations on the BT network. On request by Mercury, BT had to provide interconnection at its trunk exchanges in a certain number of cities as well as any of its local exchanges.
- Starting with capital costs, for trunk interconnection, Mercury had to pay the sum of direct costs of providing interconnection and part of the incremental costs to BT for providing the requested capacity. In particular:
- Mercury had to pay full cost of installing and maintaining physical interconnection links;

- Mercury was required to notify BT of the interconnect capacity it requested (annual forecasts of the number and location of interconnection points). If actual traffic was higher, Mercury had to pay an additional 20%;
- Mercury had to pay 50% of the incremental capacity requirements. This was probably due to the fact that Mercury's customers were expected to generate increased traffic for BT.
- For access line that BT provided for interconnection at local exchanges, Mercury had to pay the normal rental rate charged to business users for exchange lines.
- Turning to running costs, for each call made or attempted, various charges were set according to the time of day and the length of the segment used.

According to Condition 13 of the BT license, OfTel was required to set payments for interconnected calls by reference to average costs, rather than tariffs or any other yardstick. In practice, the regulator had to mediate among BT's needs (the company was in the process of modernising its technology, from analogue to digital) and Mercury's requirements to build a network while trading profitably. In the end, payments to BT for interconnecting calls appeared to allow enough margin to finance Mercury's development. They were set low enough compared to BT's retail prices, to allow Mercury to offer its customers a discount on BT's tariff. Conveyance charges were determined on a per-minute basis per segment (a call can use more segments before completion). Initial payments are reported in the following table (see Vogelsang and Mitchell, 1997):

Table 2.1. BT's interconnection charges to Mercury (p/min, single-segment)

Segment	Cheap	Standard	Peak
Local 3L	1.0	2.3	2.6
Local 3J	1.0	2.0	2.3
Short national (< 56 km)	2.2	4.4	6.0
Long national (> 56 km)	2.4	5.0	6.5

These charges apparently gave strong incentives to build a trunk network. This can be better seen by comparing the access charges with BT retail tariffs. The resulting margins available to Mercury were as follows for a 5' call:

Table 2.2. Margins available to Mercury as a percentage of BT tariff

	Cheap	Standard	Peak
Local 3L (*)	0	23	35
Local 3J (*)	0	23	42
Short national (*)	27	45	40
Long national (*)	52	50	53
Short national (2x3J) (**)	33	50	54
Long national (2x3J) (**)	60	60	67

(\*) Directly connected Mercury subscriber calling a BT subscriber

(\*\*) BT to BT, with Mercury's network selected. Call handed over to Mercury at the trunk network in the originating area and handed back by Mercury in the destination area.

The table indicates that margins were higher for long national calls and for short segments that Mercury combined with its own trunk lines to deliver long-distance calls. The weights toward calls at peak hours and trunk calls also indicate that business customers were the obvious targets for Mercury. After the determination, prices followed an RPI - 3% formula. This may sound like a price cap, but it was a mere indexation without the flexibility usually left by cap mechanisms.

### Annex 3. The 1993 determination and ADC

OfTel established that payments for conveyance calls had to include: a) conveyance rates, b) ADC and c) waivers. The calculation of conveyance rates was based on component costs and routing factors.<sup>16</sup>

In calculating BT's component costs, certain overheads were excluded as irrelevant to interconnection.<sup>17</sup> The cost of capital in the calculation was 15%, derived using the Capital Asset pricing Model (CAPM) and a formula for weighted average

<sup>16</sup> Routing factors are derived statistically for each type of call on the basis of samples that measure the use of the network. The routing factors represent the average usage of each network element by each type of interconnection segment. They should give the right incentives to use the network efficiently, but distortions can arise from the use of historic accounting costs.

cost of capital. Averaging over revenue costs and the cost of capital, the regulator reduced the total cost to Mercury by 35% in the period between the 1985 and the 1993 determinations (BT was asked to refund Mercury of £74 million). In the end conveyance rates were set to:

Table 3.1. BT's interconnection charges to Mercury (p/min)

	Cheap	Standard	Peak
Local exchange	0.67	1.16	1.53
Tandem local	0.81	1.41	1.85
Tandem short national	0.95	1.65	2.17
Tandem long national	1.20	2.08	2.73

These charges are lower than 1985 prices, especially for peak and long-distance calls. This reflects both the downward adjustments in the overall price level and the rebalancing for different cost levels and methodologies. The method had also built in some adjustments to recalculate the charges annually on the basis of the most recent BT's financial results by service.

The access deficit was calculated following the method in the box. In percentage terms, the 1993 ADCs were varying from 40% (local cheap calls) to 100% (tandem short national calls) of the corresponding conveyance rate. In monetary terms, some examples are given below (international calls ranged between 2 and 58 p/min with an average of 8.5):

Table 3.2. ADC charged to Mercury (p/min)

	Cheap	Standard	Peak
Local call	0.27	0.54	0.71
National call	0.94	1.48	1.93

#### The Oftel rule: ADC and ECPR

The access deficit (AD) of the incumbent is defined as the revenue obtained from rentals minus the costs associated with that service (in 1990/91, Oftel calculated AD = 5% of BT's £13 billion turnover). The rule used by Oftel is usage-based and allows the deficit to be recovered from a mark up on each call proportional to the profitability of that call for BT.

Imagine there are three final markets (see Valletti and Estache, 1998, section 3.1):

- the bottleneck, denoted by 0 (think of the BT's local calls),
- the good produced by the incumbent, denoted by 1 (BT's long-distance calls),
- the good produced by an entrant, denoted by 2 (Mercury's long-distance services).

Denote by  $c_i$  the marginal cost of production in the final market  $i$ ,  $q_i$  the total quantity supplied to end users, and  $p_i$  the corresponding price, and  $a$  the access charge. The incumbent's total profit  $\pi_I$  can be subdivided into the different profitability of the three activities:

$$\pi_I = P_0 + P_1 + P_2 - AD$$

$$P_0 = (p_0 - c_0)q_0$$

$$P_1 = (p_1 - c_0 - c_1)q_1$$

$$P_2 = (a - c_0)q_2$$

The total contribution of one service to cover AD is proportional to its profitability:

$$ADC_i = \frac{P_i}{\pi_I}$$

In unit terms, the access charge is set equal to its direct cost plus the ADC per unit:

<sup>17</sup> The DGT excluded retail billing, bad debts, marketing and advertising and, rather controversially, the chairman's office. The exclusions amounted to 43% of revenue costs less plant maintenance and depreciation.

$$a = c_0 + \frac{ADC_i}{q_i} = c_0 + \frac{AD}{q_i} \frac{P_i}{P_0 + P_1 + P_2}$$

As an example, if Mercury requires access for its long-distance services, BT will have one call less of its own long-distance services, hence  $a$  is calculated by setting  $i = 1$ .

When the incumbent is regulated so that its extra rents are driven to zero ( $\pi_I = 0$ ), the formula simplifies to:

$$a = c_0 + (p_1 - c_0 - c_1) = p_1 - c_1$$

which exactly corresponds to the efficient component pricing rule (ECPR). Note that there is no explicit reference to demand relationships, as Ramsey-based approaches would suggest.

In practice, Oftel's formula and ECPR differ for two reasons. Oftel adopted FDC to set  $c_0$  in place of direct incremental cost. Secondly and abstracting from waivers, Mercury was required to pay only 50% of the access deficit per minute for both picking and delivering a call, in addition to the direct cost of providing access (see Armstrong and Doyle, 1998). Mercury received waivers that were applied to local and national traffic, and the entrant had only to pay ADCs in part for international traffic. The DGT's determination was also used to determine a first standard price list for BT services to other entrants. What is important is that routing factors for conveyance rates are specific to each operator and they were incorporated into the methodology adopted.

#### Annex 4. Recent charges

In 1995 Oftel issued a new determination of standard charges still based on fully distributed costs (FDC). Prices were adjusted as actual costs were revealed using better accounting practices and engineering models. The reconciliation of the bottom-up and top-down approaches produced hybrid estimates like those shown in the fourth column of table 4.1. There is a marked difference with the corresponding figures calculated with HCA FDC. This partly due to the fact that LRIC calculations use a cost of capital of 12.5%, while data for HCA used a figure of 15%. If one calculates HCA FDC figures using a lower cost of capital, then the difference would reduce to 4-8%.

The table below clearly indicates that interconnection charges have nearly halved (in nominal terms) in the last four years. This is due to several concomitant factors: better accounting practices, improved network efficiency, exploitation of economies of scale and scope in the presence of increased call volumes, last but not least Oftel's desire to promote competition and fear of BT's market power.

Table 4.1. Interconnection charges (p/min)

	HCA FDC 1993-94	HCA FDC 1994-95	HCA FDC 1995-96	LRIC + mark- up 1994-95	1996-97 (final)	1997-98 (interim)
Local exchange	0.65	0.55	0.46	0.48	0.47	0.38
Single tandem	1.04	0.85	0.69	0.74	0.67	0.55
Double tandem	1.75	1.39	1.10*	1.25	1.00*	0.84*

Every charge is multiplied by the retail tariff gradient to give charges by time of day and day of week

\* Average of three charges by distance band.

The interim charges for 1997/98 also serve as starting charges for each safeguard cap introduced with the new regime from October 1997. The starting charges for services contained in the control baskets are based on a forecast of the relevant LRIC plus mark-up.

Oftel has also adopted a system of floors and ceilings in order to monitor potential anti-competitive behaviour. It has to be said that a violation of floors and ceilings is only a first test and the system does not represent a prescriptive rule. The key question for Oftel is the economic effect that a particular charge can have in the relevant market. The floors and ceilings are derived from the incremental and stand-alone cost methodology. The incremental cost is the one incurred by BT, while ceilings reflect the cost of a hypothetical efficient operator. The refinement of

the bottom-up and top-down approaches has improved the allocation of common costs, and this is why the range between floor and ceiling is now considerably narrower than a few years ago. As an example, table 4.2 reports differences between 22% and 39% for 1995/96, while the differences for 1994/95 were between 40% and 82% (see Cave, 1997b).

Table 4.2. Interconnection service floors and ceilings for 1995/96

Interconnection service	Floor (p/min)	Ceiling (p/min)	Difference (%)
Local exchange segment	0.314	0.435	39
Local-tandem conveyance	0.159	0.193	22
Single transit	0.068	0.083	23
Inter-tandem conveyance*	0.188-0.494	0.230-0.626	22-27

\* Includes three categories: medium, short and long.

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