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SOCIAL OBLIGATIONS AND ACCESS PRICING: TELECOMMUNICATIONS AND RAILWAYS IN THE U.K.[1]

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1. INTRODUCTION

Firms operating in the telecomms and railway industries are often required to comply with social obligations imposed by government. In telecomms, the requirement that an operator should provide a universal service at a geographically uniform price is a social obligation that has been imposed widely around the world. In the case of British Telecom (BT), it is required to provide a universal service throughout the U.K. "save in so far as the provision thereof is impracticable."[2] More recently the U.K. regulator of telecomms, the Office of Telecommunications (Oftel) has defined universal service to be "affordable access to basic voice telephony (or its equivalent) for all those reasonably requesting it regardless of where they live."[3] Other operators in the U.K. telecomms market, however, are not subject to such a universal service obligation.[4]

In addition to universal service obligations telecomm operators are often prevented from practicing undue discrimination. BT and its main rival in the long-distance market, Mercury Communications Limited (MCL), have provisions within their licenses which do not allow them to "show undue preference to, or exercise undue discrimination against, particular persons or persons of any class or description (including, in particular, persons in rural areas)."[5] One consequence of this social obligation is a considerable amount of averaging within each company's tariff structure. In particular, BT's tariff displays significant geographical averaging, with customers in areas where services can be provided at a relatively low cost often facing the same prices as customers in higher cost areas.

Railway operators also have social obligations imposed upon them. These typically require operators to provide services at certain times or in remote areas. In the U.K. the Railways Act 1993 provides for such obligations: "The [regulators] may give directions to any passenger service operator imposing on him obligations with respect to the provision or operation of railway passenger services."[6] The operators of passenger services are also obliged to participate in "approved discount fare schemes," which enable the young, elderly and disabled to travel at discounted fares.[7]

The imposition of social obligations raises the issue of how best to fund their provision. One obvious way to fund social obligations is through direct subsidies out of

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general taxation, which is how they are largely financed in the U.K. railway industry. However, in telecomms and other industries it is rare that regulators of private firms have the authority to make such transfers. Furthermore, the incentive properties of such transfers may be poor. When direct subsidies are infeasible or undesirable, social obligations must be funded from within the industry. Funding arrangements within an industry are made more complicated when they are asymmetric, especially where for historical reasons the incumbent is typically subject to more social obligations than entrants. In such an environment how might the entrants contribute, if at all, to the funding of the incumbent's obligations? If contributions are to be made by entrants, how should these take place? Should access prices be used as a way of financing social obligations? These are some of the questions we address in this chapter.

We focus on the case where social obligations are more onerous for an incumbent firm than they are for new entrants. This case certainly applies to U.K. telecomms, and it is likely to arise in the U.K. rail industry. Our concern is not about the desirability or otherwise of such social obligations, but with the way in which they are funded and the consequences the funding arrangements have for entry policy. We are especially interested in addressing the effects liberalization has on the funding and sustainability of social obligations. We argue that where an incumbent cross-subsidizes between customers and/or services to fund the provision of social obligations, this may lead to cream-skimming entry. Such entry is much more likely when entrants are required to provide fewer social obligations than the incumbent. Moreover entry of this kind undermines the incumbent's ability to fund its social obligations via cross-subsidies.

A new firm entering a network industry like telecomms usually needs to interconnect its network to the incumbent's network. This means, at least in principle, that access prices could be set so that entrants contribute towards the funding of the incumbent's social obligations. For example, a long-distance telephone company, called the entrant, may need to access a local loop operated by another company, called the incumbent, to enable the completion of a telephone call. While it is reasonable to expect the entrant to pay a charge which covers at least the incremental cost of the access service provided by the incumbent, should the entrant be made to pay an additional amount for the access service? Let us suppose that the incumbent is required to provide a universal service, but the entrant is not subject to this constraint. Furthermore, suppose that the entrant has taken profitable business away from the incumbent. For the case where the price of the access service is based on incremental cost alone, entry of this kind might make the funding of the incumbent's social obligation difficult. In such a case we can show how the incumbent's social obligation can continue to be funded by adding a component to the access charge paid by the entrant. In circumstances like this the extra component on incremental cost reflects any opportunity cost (measured in terms of lost profits) incurred by the incumbent due to entry. Furthermore, this additional term can be set so that it (i) deters inefficient entry, and (ii) funds the social obligations. This particular method of financing social obligations is commonly known as the efficient-component-pricing-rule (ECPR).[8]

The circumstances that might lead to the financing of social obligations through the use of terms added into access prices to reflect opportunity costs associated with entry stems from the nature of the social obligations imposed on an incumbent. If social obligations are asymmetric and they constrain the incumbent's discretion over prices (say due to the geographic averaging of prices), the opportunity costs of entry—the amount of

profit foregone by the incumbent due to entry and which prior to entry was used to fund its social obligations—should be added to the incremental cost of access if the provision of social obligations is to continue.[9]

In this chapter we examine the issues surrounding the setting of access charges and the funding of social obligations in the context of the U.K. telecomms and railway industries. In each case we provide background information on the market structure and highlight how recent liberalization and the potential emergence of cream-skimming entry has raised the need to focus on the way in which the social obligations of incumbents are funded. For each industry we present a stylized example to illustrate how the imposition of social obligations on an incumbent and the occurrence of entry can lead to the setting of access prices containing an opportunity cost component which is used to fund social obligations. This is followed by a discussion of the setting of access prices and the funding of social obligations in practice. In the case of telecomms we describe how the funding of social obligations was initially achieved by incorporating opportunity cost elements into access charges. However, this policy proved to be unpopular and was strongly disliked by the many entrants in the industry. As a consequence alternative methods for funding social obligations, which do not necessarily rely on access prices, are being considered. In the railway industry social obligations have traditionally been paid for by means of direct transfers from taxation. Although there may be theoretical justifications for using access prices to fund social obligations whenever there are opportunity costs associated with entry, the use of direct transfers seems set to continue. In the conclusion we summarize our arguments and suggest that funding social obligations via access prices is in practice likely to be problematic.

2. TELECOMMUNICATIONS

British governments since 1981 have promoted greater competition in telecomms. Until the early 1980s telecomms services were supplied by BT which had a monopoly in almost all aspects of the industry. The British Telecommunications Act 1981 began a more competitive policy in telecomms. In 1982 MCL became the first national fixed link public telecomms operator other than BT to be awarded a licence. In 1984 BT was privatized as a vertically integrated entity, and at the same time it was announced by Government that the provision of fixed voice telephony would remain a duopoly for seven years, this policy being known as the 'duopoly policy'. Following the end of this policy in 1991, telephony services have been opened to fuller competition.[10]

BT is subject to price-cap regulation for virtually all of its switched network services. The breadth of the cap has increased over the years and currently constrains prices affecting around 70 percent of BT's revenues. The regulator overseeing the industry is Oftel which was granted an ability to make special provisions with regard to social obligations in the Telecommunications Act 1984. The main competitor to BT in the sphere of long-distance and business telecomms services is MCL, and in the domain of local telecomms services competition is largely from cable TV companies.[11] The end of the duopoly period has meant that there are numerous companies currently operating or entering the U.K. telecomms market. BT's competitors are not subject to price capping, but nevertheless they are required to comply with the terms in their licences. In many cases a licence will

contain some limited social obligations, usually expressed in terms of geographical coverage.

Following the two-stage introduction of competition, BT's market share has fallen to around 90 percent for domestic calls and less than 80 percent for international calls.[12] Nevertheless, BT still retains a vast subscriber base and holds a virtual monopoly over access to customers' premises.[13] Since any entrant requires the use of BT's local lines in order to be able to offer an effective service, the access charges payable to BT for this service must be subject to regulation.

As we discussed in the introduction, BT faces several social obligations (in particular the obligation to supply lines to all who demand them, including low volume and rural customers) under the terms of its licence. The social obligations imposed on BT are far more onerous than those levied on any other operator. The prohibition of undue preference or undue discrimination means that BT has been funding many of its social obligations by means of cross-subsidization. The scale of BT's cross-subsidization, however, may be unsustainable in an increasingly competitive market as the emergence of unregulated competitors leads to cream-skimming. This is putting pressure on BT to rebalance its tariff structure, for instance by raising fixed charges relative to usage charges. Since privatization BT has faced a separate price-cap on line rentals (the fixed component of BT's retail tariff) which limits annual percentage price increases to within the rate of inflation plus two.[14] The rebalancing constraint itself constitutes a social obligation, justified by Oftel in terms of equity, "Sharp and unexpected movements in prices may have undesirable consequences in terms of their impact on some groups of customers."[15] The rebalancing constraint and the asymmetric nature of social obligations increases the opportunity for competitors to engage in cream-skimming entry. It results in BT losing profitable customers and market share in profitable markets and thus reduces its opportunity to cross-subsidize. This raises the question, therefore, of whether competitors should contribute a share of the cost of the social obligations imposed on BT.

2.1 Access Charges in Theory

In general the existence of social obligations and rebalancing constraints results in BT incurring deficits. Two types of deficit arise: *access deficits* due to unbalanced tariffs, where connection and rental charges lie below the costs of providing an exchange line; and *universal service deficits*, due to averaged tariffs. The existence of cream-skimming competitors further exacerbates these deficits. In Armstrong *et al.* (1996) it is argued that in a simple model and in the presence of price rebalancing constraints, the correct way to price interconnect services and cover social obligations is to use a variant of the ECPR, modified to take account of the imperfect substitutability of rival services and the possible need to assist entry. Until recently the approach in the U.K. has broadly been along these lines. In this section we present a numerical example to show how the ECPR works.

Suppose that there are three customers making use of telecomm services. A low user makes one local and one long-distance call, an average user makes two calls in each category, and a high user makes three calls in each category. The tariff is unbalanced and averaged across customers. The retail price of an exchange line is uniform across the customers and lies below its cost leading to an access deficit of 4 per customer. Each local call costs 2 and has a retail price equal to 1. The cost of a long-distance call is equivalent

to the cost of two local calls (4) plus the cost of a trunk component (2), a total cost of 6. The retail price of a long-distance call is 10. We assume that the bottleneck facilities are the exchange lines and local calls.

Table 1 Matrix of Profits across Services and Customers

Customer Type	Exchange Line	Local Calls	Long Distance	Profit
Low User	-4	-1	4	-1
Average User	-4	-2	8	2
High User	-4	-3	12	5
Profit	-12	-6	24	6

Suppose that the figures in Table 1 apply to an incumbent monopolist. The final row measures the profit it obtains for each service provided: exchange lines, local calls and long-distance calls, and the final column measures the profit across the different categories of customers. Hence, the provision of exchange lines and local services operate at a loss (due to unbalanced tariffs), and low volume users are unprofitable (a consequence of averaged tariffs). The monopoly, however, makes an overall profit of 6 and cross-subsidizes the loss making activities out of high charges for long-distance calls and high users.

Assume that the incumbent is constrained through regulation not to change its tariff (an extreme version of the rebalancing constraint). There are then two forms of cream-skimming: the entrant offers (1) only long-distance services or (2) services only to high users. In each case we assume that the entrant needs to gain access to the incumbent's bottleneck facilities, and that the incumbent is obliged to provide these services. For simplicity consider case (1). Assume that the entrant captures the whole long-distance market and sells the same quantity of services as the incumbent, i.e., six calls. Suppose first that the access charge is based on the incumbent's incremental cost, say IC, of providing access. The incremental cost of access is measured as the cost of supplying the local call components of a long-distance call. Thus the incremental cost of a long-distance call is 4, making the total access charge levied on the entrant 24. When the access charge equals this incremental cost the incumbent loses all the profit from long-distance services and cannot generate enough revenue to meet its social obligations, resulting in an overall loss of 18. Furthermore, an access charge equal to incremental cost could result in the entry of firms which are less efficient than the incumbent at supplying long-distance telecomms services.

There are various methods that can be used to finance the incumbent's social obligations. For example, the regulator could apply a surcharge of 18 on to the incremental cost of access paid by the entrant and transfer this amount to the incumbent, making the total access charge equal to 42. This extra component on the access charge would allow the incumbent to break even should entry occur. However, this additional charge still does

not guarantee that entry will be efficient. If the entrant made a profit of 2, net of the proposed additional 18 access charge, entry occurs and overall industry profit falls from 6 to 2—which is clearly inefficient. Entry by a firm which can supply the same services as those provided by the incumbent, and at a cost which does not exceed that incurred by the incumbent, is guaranteed when the extra access charge is set equal to the incumbent's profit on long distance calls, i.e., 24, yielding a total access charge of 48. In such a case the access charge ensures efficient entry; firms will only enter the market if they are at least as cost efficient in supplying long-distance calls as the incumbent.

In this example the proposed additional charge, call it T, which assures efficient entry, is an illustration of the ECPR. In this setting the optimal access charge is equal to IC+T, or in the way Baumol interprets it; Optimal Access Charge =

Incremental Cost of Providing Access + Opportunity Cost of Providing Access.[16]

Thus T should be set equal to the opportunity cost of entry, that is the loss of the incumbent's profit due to entry. The approach makes sense when the incumbent's social obligations constrain its response to entry and opportunity costs arise due to entry.

2.2 Access Arrangements in Practice

The policy on access charging in U.K. telecomms is based on a two tier system. The general principles are established by the regulator and given these principles, precise terms and conditions are supposed to be settled by the operators seeking interconnection. The general principles are specified in the licenses awarded to operators. If the operators seeking interconnection fail to agree on specific terms, Oftel can be called upon to make a determination. A determination is binding if neither party refers the matter to the more general regulatory body, the Monopolies and Mergers Commission (MMC).[17]

The most significant access agreement before 1995 was that between BT and MCL. During the first few years of MCL's operations it was inevitable that it would make extensive use of BT's network. Given the sensitivity of MCL's profitability to access charges, it is not surprising that the companies could not agree on terms following BT's privatization in 1984. After some lengthy legal battles, MCL approached Oftel in early 1985 to make a determination on the terms of access. This was published in October 1985 and we term this the *Old Determination* (OD). Following the Duopoly Review in 1991 (Department of Trade and Industry, 1991), MCL wanted to reconsider the amounts charged by BT for access. The companies again failed to resolve their differences on these matters and requested in June 1992 that Oftel make a new determination. This was published in December 1993 and we term this the *New Determination* (ND).

On each occasion Oftel faced a dilemma. As BT was forced (because of rebalancing constraints) to cover the costs of local network provision and public service obligations partly out of call charges, and if MCL was granted access to BT's local network at marginal cost, then this could lead to inefficient cream-skimming with the eventual result that BT would be unable to cover its costs. On the other hand, in the face of BT's overwhelming dominance at the time of privatization, competition from MCL was bound to be very limited, at least initially, and in danger of being stifled altogether.

In the OD Oftel set access charges which omitted an explicit component covering the opportunity cost of entry. The omission in the charges of any specific contribution to BT's access deficit was designed to assist entry:[18]

> I believe that it is reasonable to exempt a new competitor, such as MCL, from [making an access deficit contribution] in the early stages of its business development, in the interests of helping it get started. If this were not done, the ability of a newcomer to compete might be inhibited because of the economies of scale available to the original incumbent and competition might never become established. Accordingly, a decision about the introduction of a requirement to make a contribution should be a matter of timing.

Conveyance charges for interconnection were published in Oftel (1993b) and are shown in Table 2. Unlike BT's regulated retail tariff, these charges were not subject to a formal price cap, and instead were recalculated on an annual basis.

Table 2 Interconnection Charges in Pence Per Minute

Interconnection Segment	Peak	Standard	Cheap
Local 1	1.53	1.16	0.67
Local 2	1.85	1.41	0.81
Short National	2.17	1.65	0.95
Long National	2.73	2.08	1.20

Prior to 1995 the charges in Table 2 were the benchmark interconnection charges for all operators seeking interconnection with BT (see Oftel, 1994a). The charges reflect the extent to which an interconnecting operator used BT's system; as we move down the table the access purchaser uses more of BT's network to deliver a call and hence faces a higher charge. In addition, the charges have the same structure as BT's retail tariff. Section 13.5(A)3(a) of BT's Licence spells out the guiding framework used to evaluate these conveyance charges. Call conveyance charges should be set so that they cover the "fully allocated costs of the conveyance calculated on a historic cost basis, including a full contribution to relevant overheads, calculated on the basis of information supplied by the Licensee [BT], at an Applicable Rate of Return applied to the relevant capital employed."

The exact way in which these vague precepts are interpreted has not been made public, although the ND and Oftel (1994a) do contain information about the assumptions used to compute access charges. The relevant costs included in assessing the return on relevant capital employed are based on whether a cost component relates to wholesale access activities, rather than other activities. The cost of capital is established using a distributed cost methodology which measures net assets employed (see Oftel, 1992b, 1994a).

2.2.1 The access deficit

Following the Duopoly Review, Oftel introduced a reform of the access charge regime to take account of the opportunity costs of entry (see Oftel, 1991). This led to the levying of *Access Deficit Contributions* (ADCs), which are related to the opportunity cost of providing access described in section 2.1. The ADCs were designed so that all operators (in practice largely BT) could receive a contribution to their access deficit. The access deficit is defined formally to be the difference between revenues and costs from providing customers with local lines and other dedicated facilities, i.e., local access provision.

In Table 3 we provide Oftel's and BT's calculation of BT's access deficit on business and residential lines for each year over the period 1989-92.[19] It can be seen that over 1989-92 the per exchange line real access deficit declined for both line types. The decline reflects, to some extent, the amount of rebalancing that has taken place.

Table 3 An Estimate of BT's Access Deficit (£s per line per year in 1987 prices)

Line Type	1989	1990	1991	1992
Residential	54.17	54.70	55.34	47.31
Business	76.08	68.00	58.70	51.80

Sources: Based on data in Oftel (1992a,1994a) and BT Directors' Report and Financial Statements (1992).

Any calculation of the access deficit, however, is problematic due to the existence of considerable common costs and the arbitrary nature of the cost allocation methods employed. The figures in Table 3 were calculated using a distributed cost accounting system agreed between BT and Oftel. Included in the 'direct' costs of providing customer access—costs that are *not* allocated in the accounts to other services—are the cost of laying and maintaining its customers' local lines and dedicated facilities in the local exchange (see Oftel, 1993a). This seems contentious in so far as these costs would also have to be incurred to provide any other network service such as call provision. It might be argued, then that a fraction of these costs should be allocated to the other network services. If this were the case, the above figures exaggerate the scale of the access deficit. However, the numbers for the deficit are so large that probably any reasonable cost-allocation system will indicate an access deficit.

In 1991 Oftel modified the licence of BT (and that of MCL) in order to incorporate the possibility of BT (and MCL) charging ADCs.[20] The ADCs for domestic calls carried on BT's local network were calculated in the ND and are shown in Table 4.[21] The structure of the ADCs reflects BT's unbalanced tariff. The ADCs for local calls are on average 40 percent of the conveyance charges for local calls, whereas the ADCs for national calls are on average a little over 80 percent of the conveyance charges for national calls.

Table 4 Access Deficit Charges in Pence Per Minute

Call Type	Peak	Standard	Cheap
Local	0.71	0.54	0.27
National	1.93	1.48	0.94

Source: Oftel, 1993b, p. 7.

The ADCs are calculated according to the following formula:

$$ADC_i = (\pi_i/(\pi_1+\pi_2+\pi_3+\pi_4))(1/2T_i)AD \quad \text{for I=1,2,}$$

where the four quantities π_1,π_2,π_3 and π_4 represent the profits of local, national, international and other calls[22] respectively; T_i represents the total duration in call minutes of all calls in categories i=1,2 and 3 (hence excluding the 'other' category); and AD is the access deficit.[23] The ADCs are levied for each pick-up and delivery segment. For example, if someone directly connected to MCL's network were to make an average national call (long-distance) at the standard rate to a BT customer, MCL would pay BT ADC_2=1.48 pence per minute as an access deficit contribution, together with a conveyance charge 1.65 or 2.08 pence per minute. Alternatively, if MCL carries the same call that is both picked up and delivered on the BT network, it will pay 2 times ADC_2=2.96 pence per minute, exceeding the conveyance charge. These figures illustrate the magnitude of the ADCs, and hence their significance in affecting interconnecting operators' costs.

The motivation behind these formulae for ADCs goes as follows. BT's access deficit is financed from the profits π_i it makes on calls and, somewhat arbitrarily, it is supposed that calls of type i contribute a proportion $(\pi_i/(\pi_1+\pi_2+\pi_3+\pi_4))$ to this deficit. Following the same logic, a single minute of a call of type i contributes $(\pi_i/(\pi_1+\pi_2+\pi_3+\pi_4))(1/T_i)AD$ towards the deficit, and so any call-minute that is carried by a rival operator, assuming a one-for-one displacement of calls, removes this contribution to BT's ability to fund its deficit. Therefore, the ADC for calls of type i equals this quantity. Since the opportunity cost to BT is the same whether BT picks up and/or delivers the rival's call, the ADC should ideally be independent of whether BT picks up and/or delivers the call. The extra division by two in the above formula for local and long-distance ADCs is, therefore, somewhat *ad hoc*. The idea is that ADCs are charged for each pick up segment and delivery segment (rather than per call), and so a call that is both picked up and delivered should pay half the quantity $(\pi_i/(\pi_1+\pi_2+\pi_3+\pi_4))(1/T_i)AD$ at each end. The problem with this system is that a call from a MCL customer, say, that needs only delivery by BT involves a charge that is only half the correct ADC. In other words, MCL must pay twice the ADC for indirectly connected customers than it does for its directly connected customers, even though both types of call involve the same opportunity cost for BT.

There are a number of conditions under which Oftel may choose to waive a rival carrier's ADCs, see Condition 13 in BT's licence. These derive from arguments relating to entry assistance and equal access. Oftel has stated that waivers may be given to rivals if their sales revenues are less than 10 percent of total market revenues in the category

considered. In the year ending March 31, 1993 MCL had around 7 percent of the market share for inland calls and received a full waiver on its ADC in this category. In the same period, however, MCL contributed to BT's access deficit through charges levied on international calls because it held a market share in this category in excess of 10 percent (see Oftel, 1993b). Mobile telephony services are not regarded by Oftel as directly substituting for the fixed services provided by BT, in which case there is a lack of opportunity cost problems. Thus operators of mobile telephony services do not usually have to pay ADCs.

2.2.2 The new regime: access charges from 1995 onwards

In January 1995 a new access charging regime was introduced (see Oftel, 1994a). The introduction of the new charges followed disquiet in the industry about the setting of access charges, and in particular the levying of ADCs. The new charges were introduced at the same time as an accounting separation of BT, the latter requiring BT to provide separate accounts for its three principal businesses: BT Network (BTN), BT Retail (BTR), and BT Access (BTA).[24] The main purpose for separating BT's businesses along these lines is to introduce greater transparency and thus reduce the possibility of BT exercising undue discrimination in the levying of access charges. In particular, BTR should face the same prices for access as those offered to other operators by BTN.

The access charge regime established in 1995 was viewed by Oftel as an intermediate stage, with work continuing on the development of a new system for interconnect charges. The 1995 access charges were based on a more disaggregated set of services than those shown in Table 2, with over 70 different interconnect services being subject to regulatory oversight. However, the 1995 charges continued to be calculated in accordance with fully allocated costs based on historical costs, and the system retained the setting of the unpopular ADCs.

At the end of 1994 Oftel published a wide ranging consultation document dealing with the future of interconnection charges and related issues (see Oftel, 1994b). In the document Oftel indicated that it wished to depart from the setting of access charges based on fully allocated historic cost accounting principles. In particular, Oftel seemed to prefer an approach where access charges would be based on measures of long run incremental costs. It was recognized, however, that such charges would need to be adjusted to reflect common costs and the cost of social obligations. Oftel proposed various ways of doing this, including the use of the Ramsey principle and the use of the ECPR. However, subsequent to the consultation Oftel (1995) has rejected both these approaches and has indicated that it favors an adjustment based on equal mark-ups.[25]

Oftel also announced in 1995 that it would scrap the rebalancing constraint imposed on BT and as a consequence abolish the unpopular ADCs. These measures, to take effect in 1996, give BT greater flexibility and result in a shift away from paying for social obligations through levies added on to access charges.[26] However, despite these changes BT will continue to face a universal service obligation and thus it will continue to serve some customers who are 'uneconomic'. Preliminary estimates of the financial costs to BT of the universal service obligation, undertaken on behalf of Oftel by Analysys (1995), lie in the range £58-89 million. (However, this relatively small cost does not include the cost to BT of having a uniform geographical tariff.) Oftel has proposed that universal service

costs should be funded by the industry as a whole through the operation of a Universal Service Fund.

The new regime (which at the time of writing had not been agreed by all the parties involved) for funding social obligations and setting access charges will not take full effect until 1997 at the earliest, allowing time to make appropriate measures of BT's incremental costs. Oftel has indicated that these charges will be subject to a conventional price-cap so that BT faces desirable incentives to improve efficiency and hence lower the costs of providing interconnect services.

3. RAILWAYS

Between 1948 and 1993 successive U.K. governments operated the railways as a vertically integrated state monopoly.[27] In 1993 the railway industry was structurally reorganized, following the passing of the Railways Act in November 1993. This paved the way for a much greater involvement by the private sector and increased competition. The new system is based on franchising passenger services and open competition in freight markets. It relies on the separation, in terms of ownership, of the network infrastructure (track, signaling, stations, etc.) from the provision of train services. Although competition is being introduced relatively speedily into freight services, the emergence of competition within passenger service operations will only be on a restricted basis until at least 1999 (see ORR, 1994d).

An examination of the railway industry shortly before the start of the recent reforms reveals the extent to which it depends on subsidies. In the U.K. there are two broad class of services: freight (including parcels) and passenger services. Prior to the reforms British Rail (BR) operated most of the passenger services and these were organized into three broad categories: InterCity, Network SouthEast (NSE) and Regional Railways. InterCity provided high speed inter-urban services, NSE provided the London commuter services and local services in the south east of England, and Regional Railways provided urban, rural and some cross country services outside of the south east. The financial status of the businesses at the end of the financial year March 1993 is shown in Table 5. It can be seen that NSE and Regional Railways relied heavily on subsidies which were provided by central government. A considerable fraction of the subsidy was needed to fund the social obligations: the need to operate a full timetable, operate unprofitable routes, etc.

Before describing the theory and practice of access prices it is helpful to explain how the new passenger franchise system works, as it is these services which are subject to the imposition of social obligations. Passenger services are gradually being franchised out to the private sector, and it is an objective of Government to franchise at least 51 percent of the services by the first quarter of 1996. (In some special cases there will exist franchises where the franchisee owns or leases network infrastructure. These will be for services which are largely self-contained and do not require much coordination of timetabling and access.) A total of 25 franchises will be put out to tender, based on geographic areas and types of service provided. The first generation of passenger franchise holders are protected from open access competition, that is to say direct competition from outside operators, at least until 1999 (see ORR, 1994d).

Table 5 Financial Status of BR's Services £ million (1993)

Business	Revenue (exc. subsidy)	Profit (loss) (exc. subsidy)	Subsidy for Social Obligations	Subsidy as % of Revenue
InterCity	825.9	65.1	0	0
NSE	998.2	(46.1)	51.1	5
Regional	329.5	(503.2)	503.9	153
Freight	722.8	(9.9)	0	0

Sources: Department of Transport (1993).

Franchisees are regulated by the Office of Passenger Rail Franchising (OPRAF) which is responsible for the creation and monitoring of franchise contracts. OPRAF is also involved closely in the negotiation of access charges between franchisees and Railtrack,[28] the specification of quality of service thresholds, the control of fares in franchise areas with limited competition, the pace of franchising, the administration of the tender process, and the collection of franchise fees or payment of subsidies.

Before the passenger franchises were put out to tender the Government (through OPRAF) guaranteed to underwrite Railtrack's costs of facilitating passenger services by providing any necessary subsidy to make up any shortfall in bids. Prospective franchisees were informed that the structure of access charges would comprise a fixed charge and a variable component, and they were informed about the level of the variable access charges (see section 3.2 below). Prospective franchisees are invited to submit bids for the right to operate services, and in these they must indicate the amount of the fixed access charge they intend to cover. Any shortfall between a successful bid and the level of fixed charges will be met by OPRAF. In effect prospective franchisees participate in an auction where bidding is in terms of the amount of subsidy required. Those willing to pay more of the fixed access charges therefore have a greater prospect of winning a tender. The amount received by Railtrack in respect of the fixed component of access charges, however, is unaffected by this tendering process. Thus social obligations will continue to receive support from government. Four possible bids and ways of covering a fixed access charge of 100 are illustrated in Table 6.

It can be seen in Table 6 that it is OPRAF (or the government) which bears most of the risk in the tendering process. This seems reasonable as it is OPRAF which negotiates and establishes the terms of the franchise specification (including the social obligations) and associated access rights. The bottom row of Table 6 illustrates the case where a potential franchisee bids an amount insufficient to cover the variable costs of access. In this case OPRAF subsidizes the avoidable costs of the franchisee's service.

Table 6 Example of Franchise Bidding and Railtrack Income

Fixed Component of Railtrack's Access Cost	Bid submitted by Franchisee	OPRAF's Contribution via Franchisee	OPRAF's subsidy to Franchisee's own cost	Railtrack Income
100	100	0	0	100
100	50	50	0	100
100	0	100	0	100
100	-50	100	50	100

Source: Based on table in Department of Transport (1993).

3.1 Access Charges in Theory

Table 5 above indicates that the cost of social obligations in British passenger railways, and in Regional railways especially, are considerable. Although much of the cost of the social obligations is funded through general tax revenue, British Rail nevertheless designed its tariff and operational structure in a way that enabled it to use cross-subsidization.[29] The principal cross-subsidy flows from travelers making journeys during the peak periods (early mornings/late afternoons) to those using the trains during off-peak periods. This form of price discrimination continues under the new franchised system. The limited extent and in many cases the non-existence of direct competition during the first generation of franchised passenger operations mean that opportunity costs due to entry will not arise, thus greatly simplifying the design of access charges and funding of social obligations. As franchise holders are regulated both in the prices they may charge for services and services they should offer, the particular choice of access charges has very little impact, and merely affects the size of the transfer from a franchise holder to Railtrack.

In the longer term the Regulator is hoping to encourage greater competition in passenger services. The prospect of open access competition may lead to the same cream-skimming problems we discussed in section 2.1. Incumbent operators faced with social obligations (such as being required to offer services on loss-making routes) may loose business to cream-skimming entrants with less burdensome obligations. In Table 7 we present a numerical example of an incumbent with social obligations. In this case the social obligation is the requirement to operate a service over Route 2. The government is assumed to contribute partially towards the losses incurred on Route 2 by means of a direct subsidy, and the remaining contribution is derived from a cross-subsidy flowing from the users of Route 1.

Assume that the entrant cream-skims by operating Route 1, paying an access charge to the supplier of the network infrastructure equal to 5. In this case the incumbent would make a loss of 8 despite receiving a subsidy of 8. Open access competition gives rise to opportunity costs of entry identical in form to those discussed in section 2.1. One method

of financing and sustaining the social obligation Route 2 is to tax the entrant and transfer the revenue to the incumbent passenger operator. In effect this would preserve the cross-subsidy. To ensure that entry is efficient this additional access charge should equal 10, making the total access charge 15.

Table 7 Matrix of Profits for a Franchise Area

	Route 1	Route 2	Total
Revenue	20	2	22
Subsidy	0	8	8
Access Costs	5	5	10
Other Costs	5	13	18
Profit	10	-8	2

In the U.K. policy is directed towards encouraging competitive bids to operate routes. Thus in the example shown in Table 7 there could exist many potential operators of Route 1, leading to the possible erosion of profits on that route. However, the size of the winning bid should reflect the available rent and this could be used to fund the social obligation Route 2. As direct subsidies are provided to operators, the regulator could seek bids from potential operators to run services over Route 2. It is perfectly possible that an entrant could provide Route 2 at a lower cost than the incumbent. This aspect is a key component of the new U.K. policy on railways and is in sharp contrast to the policy to date in telecommunications.

3.2 Access Charges in Practice

As outlined above the 1993 Railways Act resulted in the separation of ownership of the network infrastructure from the passenger and freight service operations. Railtrack negotiates access charges with service providers; the most significant are the companies providing freight and passenger services. Being a monopolist Railtrack is subject to regulation which is undertaken by an independent body the Office of the Rail Regulator (ORR). The Rail Regulator is primarily responsible for overseeing the access charge regime, and in particular is closely involved in the setting of access charges for franchised passenger services.[30] There are two main class of access agreements ORR is currently regulating: (i) those between Railtrack and the freight and 'open access' passenger service companies (i.e., those passenger services not operating under franchised agreements, such as chartered services) and (ii) those between Railtrack and passenger franchisees. In areas where competition is developing the ORR is strongly encouraging the commercial negotiation of access charges, but in the domain of franchised passenger operations the Rail Regulator has established a detailed framework for access charges within which commercial agreements must work.

3.2.1 The initial set of access charges

The first set of rail access charges following the reforms were established prior to the setting up of ORR. The general framework for these charges was outlined by the government in a document called *Gaining Access* published by the Department of Transport (1994). A system of cost based charges was favored, with operators being expected to cover at least the short run variable (or avoidable) costs. The charges were devised with a view to subjecting Railtrack to rate of return regulation. It was also stated that all operators should contribute to Railtrack's common costs differentially, reflecting "their ability to pay." In effect the government was endorsing mark-ups based on 'Ramsey like' principles.

Short term unregulated (or administered) access contracts were put into place in April 1994, before the Regulator's powers came into effect. The access charges for 1994-95 included two variable charges (track usage and electric current usage), and a fixed charge. However, the variable charges were only 9 percent of the total charges, with the remaining 91 percent of the access charges comprising a fixed charge contributing to Railtrack's common costs. These fixed charges were calculated with a view to providing Railtrack a real return of 5.1 percent on its assets. It was expected that Railtrack would move towards a real rate of return of 8 percent on its asset base by 1998, but that this would be achieved through efficiency gains.[31] Thus access charges were to be kept at their 1994-95 levels in real terms.

3.2.2 The review and reform of the initial access charges

In 1994 the newly appointed Rail Regulator undertook a review of the access charges (see ORR, 1994a,b,c and 1995a,b). The review focused on both the level and structure of charges. In terms of the levels, the Regulator abandoned rate of return regulation and has instead adopted an explicit price-cap. ORR calculated that Railtrack was in a position to reduce its real costs by around 3 percent per year over a six year period. In order to preserve incentives the Regulator set X in the price cap equal to 2, to extend over the period between 1996 and 2001. The initial set of access charges in 1995-96 were established by reducing the 1994-95 levels by 8 percent in real terms.

The price-cap introduced by the Regulator has a sliding-scale component. If Railtrack's return from property divestitures is greater than expected, the gains are to be shared between Railtrack and its customers. On the other hand, if Railtrack faces additional costs arising from a change in its legal obligations, it is permitted to pass these on to operators. In addition, the price-cap is supplemented by explicit measures of service designed to ensure the maintenance of quality.

With regard to the structure of access prices the Regulator introduced measures to ensure that the variable component more accurately reflect the short run variable costs imposed on Railtrack by users. The Regulator expressed concern about the high level of the fixed charges, but conceded that where access charges are based on costs in an industry with considerable fixed costs this was inevitable. However, in the future the Regulator hopes to introduce some Ramsey type component based on willingness to pay into access charges when more information about operators should be known.[32]

4. CONCLUSION

In this chapter we have sought to highlight the relationship between entry and the funding of social obligations in the U.K. telecomms and railways industries. In both cases we showed how social obligations, funded wholly or partly through cross subsidization, can be undermined by cream-skimming entry. If the opportunity costs due to entry are not accounted for in the setting of access charges, the funding of social obligations using cross-subsidization may not be sustainable in the longer term. One way of sustaining the financing of social obligations is to add a term in to the access charge which reflects the opportunity costs associated with entry. By doing this the funding of social obligations is internalized within the industry through inter-firm transfers, and in addition, encourages only those entrants which are efficient.

Accounting for the opportunity costs of entry leads to access charges which in structure resemble the efficient-component-pricing-rule (ECPR). However, the version of the ECPR we presented is predicated on the existence of an efficient incumbent producer. In cases where an incumbent produces bottleneck facilities inefficiently, the application of this version of the ECPR may lead to under-investment by entrants. This would arise because access charges would be too high—reflecting the incumbent's inefficiency. In some instances, therefore, there might be good reasons to consider the granting of abatements, at least for some temporary period, on access charges levied on entrants. By lowering access charges in this way entry would be stimulated and the incumbent would find it advantageous to improve efficiency. Nevertheless, even when inefficiencies of this kind are taken into account, the imposition of social obligations on the incumbent will always result in opportunity costs of entry.

In U.K. telecomms the regulator has applied access charges that reflect the opportunity costs of entry. These are known as access deficit contributions, as they are intended to contribute towards the deficit incurred by BT in the provision of exchange lines. In practice there have been problems in setting 'appropriate' access deficit contributions, due in part to arbitrary accounting methods which lead negotiating parties to disagree over the scale and allocation of common costs, but also caused by controversies over the desirability of assisting entry. This has led the regulator to abandon this approach and alternative methods of funding social obligations are being considered. In the railway industry open competition in passenger services has yet to occur and the issue of opportunity costs has therefore not arisen. However, the traditional use of direct transfers in the rail industry as a means of partially funding loss making services will imply that the complications of funding social obligations via access charges will be less pronounced.

Although a cogent theoretical case can be put forward to support the idea of incorporating opportunity cost elements into access prices, in practice this is likely to be fraught with difficulties. In the case of U.K. telecomms such access prices have been unpopular because entrants feel that the incumbent has a tendency to overstate the cost of social obligations. In a situation where the interests of the entrants and the incumbent are diametrically opposed, and where information about the costs of social obligations may be difficult to assess, it would seem imprudent to use access prices to fund fully the incumbent's estimate of its social obligations. In industries where cream-skimming entry occurs, the full funding of an incumbent's social obligations through cross-subsidization

will be compromised. If this is a real problem, the incumbent should be allowed greater tariff flexibility and other ways of funding social obligations should be considered.

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NOTES

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2. The requirement that telecomm services should be available nationally is an objective that the regulatory bodies are required to achieve under the Telecommunications Act 1984, Section 3(1)(a).

3. See Oftel (1995), paragraph 4.4.

4. There is one other telecomms company in the U.K. which for historical reasons also faces a universal service obligation within its operating area. This is Kingston Communications which provides services in the Hull area in Northern England.

5. Telecommunications Act 1984, Section 8(1)(d). In the case of BT Conditions 17 and 17A of its Licence deal with undue discrimination or preference. Condition 17A does permit BT to offer bulk purchasing discounts for some services. However, BT is not permitted to offer a geographically deaveraged tariff for basic telephone services.

6. Railways Act 1993, Section 136(6).

7. Railways Act 1993, Sections 28(3)(a)-28(5).

8. The efficient component pricing rule is credited to Willig (1979) and Baumol (1983). See also Grimm and Harris (1983) and Baumol and Sidak (1994). Armstrong *et al.* (1996) and Laffont and Tirole (1994) present comprehensive theoretical accounts on the ECPR. See also the contributions in Part I.

9. In Armstrong *et al.* (1996) it is shown that when an incumbent cannot adjust its retail prices in response to entry, possibly due to the imposition of social obligations, the ECPR is optimal in a second best sense.

10. See Department of Trade and Industry (1991). See Armstrong *et al.* (1994, chapter 7) for an account of developments in the U.K. telecomms industry.

11. Since 1991 cable TV companies have been free to offer and operate switched telephony services, but BT and other national public telecomm operators are not permitted to offer entertainment services (i.e., TV broadcasts).

12. See Oftel (1993b), p. 22, paragraphs 36 and 37.

13. In some areas of the U.K., principally large conurbations, penetration by cable TV companies into the telecomms market has been impressive. Nevertheless, cable TV companies currently serve around 375,000 telcomm subscribers, contrasting with BT's subscriber base of around 25 million (around 20 million residential).

14. This does not apply to businesses with more than five lines. Oftel (1995) proposes that the separate price-cap on BT's line rentals be abolished in 1996-97.

15. See Oftel (1992a), paragraph 126.

16. See Baumol (1983) and Baumol and Sidak (1994).

17. In 1995 a new regime for establishing access prices was proposed and may be introduced in 1996, see section 2.2.2 below.

18. A statement made by the Director General of Telecommunications; see Department of Trade and Industry (1991), paragraph 56, Appendix 2.

19. The figures in Table 3 are based on historical cost accounts computed by BT and Oftel. It is assumed that the cost of capital for each year over 1989-91 was 18 percent, and for 1992 it was 15 percent. This is in accordance with the rates used by BT and Oftel. The higher figure shown for business lines is explained by a larger fraction of depreciation costs being allocated to business line provision. Over the period digitalization disproportionately favored business lines.

20. See Conditions 13.5A 3-5 of BT's Licence.

21. The figures in Table 4 apply for the period from June 1992 to the end of March 1993. ADCs are recalculated on an annual basis. ADCs are also levied on international calls. Condition 13 of BT's Licence states that the ratio of the peak ADC to the off-peak ADC charges should be the same as that for retail call charges.

22. Other calls are a relatively small fraction of total calls. These include emergency call facilities which are freely available to all customers.

23. The ADC for international calls is defined as $ADC_3 = (\pi_3/(\pi_1+\pi_2+\pi_3+\pi_4))(1/T_3)AD$, where 2 is omitted in the denominator because only one domestic exchange line is used.

24. BTN covers wholesale activities largely in trunk switching and transmission, BTR covers services sold direct to customers, excluding those provided by BTA which provides connections, exchange lines and other access services.

25. Paragraph 2.35 in Oftel (1995) notes "Responses to the Consultation Document revealed a general lack of enthusiasm for Ramsey or ECPR mark-ups because of their complexity and because they both depend to a degree on a subjective assessments of key elements of the calculations. In addition, the ECPR suffers from the defect that, because

it is based on BT's retail call prices, competitors would be under pressure to price their calls in a way that reflected BT's retail pricing choices."

26. The scrapping of the separate price-cap on line rentals is accompanied by a new cap designed to protect low users. Oftel has proposed that the bill of a typical low user should not increase in real terms.

27. There were some exceptions with limited private sector involvement, particularly in freight services. Passenger Transport Authorities (consortia involving local authorities) are also involved in local and city rail service provision.

28. In April 1994 British Rail's network infrastructure was vested in a new publicly owned monopoly called Railtrack. This is responsible for maintaining the infrastructure and for the timetabling of services. Railtrack contracts much of its work to private sector companies and some components of its business, such as the operation of stations and car parks have been, or are in the process of being, leased or sold to private sector interests. Railtrack comprises 10-12,000 employees, some 20 percent of the old BR staff; *House of Commons Transport Committee*, "Future of the Railways" (21 July 1993). The U.K. Government aims to privatize Railtrack.

29. The packaging of the initial passenger franchises was done in a way to enable the continuation of cross-subsidies between different services (see Bolt, 1995).

30. The main functions of ORR are to issue licenses to service providers and to approve the terms on which they gain access to the network. ORR undertakes these functions with a view to protecting the interests of rail users. ORR also exercises due regard to the financial position of OPRAF and Railtrack.

31. The figure of 8 percent is the U.K. Government's target real rate of return for public sector entities operating in commercial environments.

32. The access charges levied on freight and open access passenger services are expected to cover at least their variable or avoidable costs, but may not include any contribution to Railtrack's common costs. For this reason these charges may omit the fixed component (see ORR, 1995b).