Regulation and Inefficient Entry: Economic Analysis and British Experience[*]

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Abstract
This paper discusses recent British policy towards the introduction of competition into regulated industries. The dangers of regulatory policy for inefficient entry are considered under three broad headings: problems with entry caused by (i) the protection of incumbents, (ii) the protection of entrants, and (iii) the protection of consumers. Included in the analysis are discussions of temporary monopoly franchising, of policies that involve the licensing of just a few firms, of cross-market entry restrictions placed on incumbents, of market share targets imposed on incumbents, of the danger of "predatory" behaviour when the incumbent operates under an average price cap, of the encouragement given to entrants when the incumbent cannot engage in price discrimination, of the economic distortions caused by universal service programs (such as geographically uniform prices), and of the relationship between the incumbent's retail tariff and its network access charges.

1. Introduction

This paper explores some unpleasant interactions between policies for regulating firms with market power and policies for achieving efficient entry. These anti-competitive effects of regulation can take many forms, and it is clear that different policies will have different effects: sometimes the "wrong" kind of entry will take place, and sometimes the "right" kind of entry will not take place. In this paper the examples of such problems are taken from the British experience of regulation and liberalisation.[1]

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[*] Paper presented for the meeting "The Anti-Competitive Impact of Regulation", held in Florence, 10/11 September 1999. All views and errors are entirely my own.

[1] Of course, I choose Britain not because it has an especially poor record in enabling efficient entry – I do not think it has – but because (i) it is the country about which I know the most, and (ii) it has a longer record of attempting some liberalisation of network industries than most other countries in Europe.

Of course, it might sometimes be a deliberate – and justified – policy to sacrifice productive efficiency for some wider goal, but nevertheless a careful analysis of the costs involved in this needs to be carried out, and that is the purpose of this paper. The discussion is carried out under three headings: the problems for productive efficiency associated with (i) the protection of incumbents, (ii) the protection of entrants, and (iii) the protection of consumers. Of course, it is not always easy to separate out policies neatly under these three headings, especially as regulators often justify their policies as being in the "interests of consumers". For instance, universal service obligations are there ostensibly to protect certain vulnerable consumer groups, but act also as a justification for protecting incumbents (e.g. against cream-skimming entry). In addition, however, these social obligations also act in practice to *assist* entry into profitable markets.

Of course it is always an easy task to criticise existing policies. The interaction of regulation and liberalisation is particularly complex, and it is inevitable – especially in a country like Britain that was one of the pioneers of utility regulation – that early policies will be flawed. However, this paper does not attempt to go beyond this remit, and, except at the end when some policies for access charges that ensure efficient entry are briefly discussed, there is little analysis of how policy should be.

2.   Problems associated with the protection of incumbents

Some of the most flagrant examples of anti-competitive policy-making are concerned with protecting incumbents from the full rigours of competition. These policies are discussed under the following headings:

Monopoly franchises: One policy is to grant an incumbent firm a monopoly franchise, perhaps for a temporary period. Obviously there is no more clear-cut example of anti-competitive regulation than this, but it remains surprisingly common. Recent examples of this in Britain include:

- Gas and electricity supply to residential customers were legal monopolies until 1998;
- Postal service (currently for letters costing under £1) is still a legal monopoly.

The argument usually given for *temporary* monopoly is that incumbents somehow require a 'transitional' period to prepare for full-blown competition.[2] But the evidence is that a more effective way for inefficient incumbents to become competitive is actually to face competition. A more cynical explanation for such policies is that they are part of the "privatisation contract", i.e. a kind of bribe paid to the incumbent (including both the employers and employees) to persuade it to support the privatisation process.

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[2] Another argument, especially in less developed or transitional economies, is that the profit generated by enforced monopoly enables there to be a higher degree of investment – see Armstrong and Vickers (1996) for some tentative arguments along these lines. This argument seems to require the economy to be in such a bad state that funds from neither taxation nor from private lenders are forthcoming, and most investment funds can only be generated internally by the firm.

Another argument against competition is that it may undermine various politically desirable cross-subsidies built into the incumbent's tariff (for instance, tariffs favouring residential customers at the expense of businesses). This argument is certainly true – it is virtually impossible to combine cross-subsidies with laissez-faire competition in the long term – and the argument is used to justify the ban on competing postal services in Britain (and most of the rest of the world). Indeed it is perhaps the chief negative aspect of universal service obligations that they provide incumbents with a reasonable-sounding argument for entry restrictions. However, we will come back to the problems caused by these kinds of 'universal service' policies in section 4 of the paper, and we will see that, even if it is desired to maintain the cross-subsidies, there are superior ways to do this than to ban entry.

Unequal tax treatment of entrants and incumbents: Another example of public policy being used to protect incumbents from competition is the method of funding the BBC in Britain. From a purely economic point of view, the current funding arrangements for the BBC are dramatically anti-competitive. Anyone wishing to watch any kind of TV programming (other than via a video machine) is required to pay the BBC Licence fee – around £100 per year – even if they do not wish to watch the BBC's output. As a result, for those who watch TV at all the BBC's output is free at the margin, and other broadcasters have somehow to attract viewers whilst at the same time funding their output by more conventional means (advertising or subscription). The result is likely to be that superior rivals will still find it hard to compete against the BBC for viewers.[3] It is hard to imagine such an arrangement being tolerated for any other industry. The usual argument for this is that the BBC is a "public service" broadcaster, producing output this is more socially desirable than that produced by purely commercial broadcasters. However, this old argument has been given a new twist, and the latest controversy is a plan for the BBC to levy an additional 'digital' license fee on all those who subscribe to new digital services – such as BSkyB's – in order to fund the BBC's own entry into these new markets.[4]

Unregulated access to incumbent's facilities: The final way we discuss how a lenient treatment of incumbents will lead to anti-competitive effects is that of a *laissez-faire* attitude towards access by entrants to the incumbent's network facilities. It is common sense that, without regulation, a network monopoly will usually inhibit competition in services provided over its network by setting high network access charges, especially if it is vertically integrated. A good example of this in Britain was British Gas soon after its privatisation. The company was required by its Licence to allow third-party access to its pipeline, but the level of access charges was left free for the incumbent to choose. The result was that for the first 7 years after its privatisation, British Gas faced no rivals in gas supply. (There was an MMC investigation in 1987 that recommended, among other things, that British Gas be required to publish information about its access charges, rather

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[3] This artificial advantage is offset to some extent by the ban on the BBC using advertising as a source of funds. However, public support for the BBC being funding by the licence fee rather than advertising is apparently rather mixed.

[4] For more details on this proposal, see the Davies Report on *The Future Funding of the BBC*, Department for Culture, Media and Sport, published July 1999.

than negotiate terms bilaterally, but this reform does nothing to reduce the *level* of the firm's access charges, which remained uncontrolled.) Obviously, such a policy means that there was little opportunity for entrants which were more efficient than the incumbent in providing services over the incumbent's network to compete effectively. (See Armstrong *et al.,* 1994, section 8.4.2, for more details.)

3.   Problems associated with the protection of entrants

It is a common regulatory practice to "assist entry", especially in the early stages of liberalisation.[5] There are a large number of entry barriers and incumbency advantages in the network industries – to do with sunk costs, customer inertia, and so on – and a natural question is whether potential entrants should be given special assistance. It is fair to say that economic theory has not generated any clear-cut general principles in this regard: entry assistance might stimulate beneficial future competition that otherwise would not exist, but might also damage productive efficiency and distort competition. However, even if we remain agnostic about the merits of such assistance, it is worthwhile to examine the drawbacks of the various *methods* of providing assistance, as is done in the following. (We postpone questions about entry assistance to do with the incumbent's universal service obligations and other pricing restrictions until section 4 of the paper.)

Limitations on further entry: One common policy is that only one or two firms are licensed to compete with the incumbent. In the UK, a good example of this was the "duopoly policy" in fixed link telecommunications from 1984 to 1991, when only Mercury (as it was then known) was permitted to offer a nationwide service in competition with BT. Protecting one or more entrants by raising legal barriers to the entry of further firms is a curious means with which to assist entry. The idea is presumably that no entry at all would occur unless there is a guarantee against further entry, and a little entry is better than none. Three arguments against this policy are:

- If a second entrant would make the first entrant unprofitable, why would the second firm enter (unless it was much more efficient than the first, when it would be good to have this entrant in any event)?
- A ban on further entry is likely to make collusive behaviour between the two firms more tempting.
- The main effect of the policy is likely to be to benefit the incumbent rather than the entrant – if entry assistance is desired it can surely be better targeted?

Asymmetric treatment of incumbents and entrants: Often entrants are freed from restrictions placed on incumbents, such as universal service obligations and prohibitions on cross-market entry. The fact that an entrant might be permitted to pick and choose the markets and customers it wants, while the incumbent is forced to serve all customers at a distorted tariff, is a major source of entry assistance, but we defer this discussion to the next section when we talk about universal service.

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[5]   See Armstrong *et al.* (1994, sections 4.2.2 and 7.2.2) and Armstrong (1998) for more details on this issue.

Often, incumbents are prevented from serving a related market as a means to encourage entry into that related market. Recent examples in Britain include:

- The ban from 1991 to 2001 on BT providing TV and other entertainment services over its telecommunications network, whereas the cable companies were encouraged to provide both TV and telecommunications services jointly over their networks. The policy was explicitly designed to aid the cable companies in their entry to the telecommunications market – this being done indirectly by making their entry into in TV provision more profitable – with the long-run aim of providing viable rival infrastructure to BT's network. (See Department of Trade and Industry, 1999, pages 25-6 for more details.) Since the cost of local network duplication is several hundred pounds per line, the long run benefits of having several competing telecommunications networks must be substantial to justify this policy.
- Oftel's unwillingness to require BT to offer 'equal access' to rivals in the long-distance and international call markets, at least historically. (Oftel has now been required by the EU Commission to provide equal service by the year 2000, although Oftel is seeking a small deferral of this requirement – see Oftel, 1999b, for more details on its recent policy.) This policy benefits local entrants such as the cable companies because many subscribers switch to cable companies in large part due to the cheaper long-distance and international calls on offer, services that are *not* conveniently available from BT's network when equal access is not in place. As well as there being a danger of inefficient entry into the local market, this policy also leads to the possibility that efficient entry by indirect long-distance firms is forestalled.
- BT is not allowed to use 'fixed wireless' technology in its local loop, except in specified rural areas. This policy was intended in part to assist the entry of Ionica (a purely fixed-wireless entrant), a firm which has since gone bankrupt.
- In the pay-TV market, BSkyB's satellite distribution platform is treated quite differently from the cable industry's, even though each platform has broadly comparable subscriber numbers. For instance, BSkyB is required to provide third party access to its platform for rival retailers, whereas the cable platform is 'closed', and BSkyB cannot retail its channels directly to cable subscribers (and instead must sell its programs at the wholesale level to cable firms who then price and market these channels themselves).

Competition in a market can seriously be impaired if the incumbent is prevented from participating in some important aspect of the market. The choice between "conduct" and "structural" remedies is a difficult one. British regulatory policy in this regard has been extremely mixed: some privatisations have been accompanied by vertical restructuring and some have not. However, it is fair to say that the most recent policies have involved a more lenient attitude towards vertical integration – for example, the relaxation of the strict separation between electricity generation and supply in Britain – and this trend has the pro-competitive advantage of keeping incumbents in all the markets.

Explicit market share targets for incumbents: A superficially desirable policy for regulators keen to ensure effective competition in their industry is to aim at a specified market share reduction by the incumbent firm. For one thing, achieving such a target

may provide an easy way to demonstrate how effectively regulators are doing their job. However, even ignoring the well-known drawbacks of using raw market share data as an indicator of competitiveness, such a policy is bound to be anti-competitive, in the sense that the incumbent is then required by regulation to compete *less* effectively (for instance, by increasing its prices). The likely result is that inefficient entrants will prosper.

British Gas provides a good example of such a policy in the UK:

- In the 1988 MMC report into gas competition, the MMC recommended that British Gas was required to contract for not more than 90% of the new gas coming to market;
- More drastically, in 1992 the Office of Fair Trading recommended that British Gas reduce its market share in the business market (excluding that used for electricity generation) to 40% by 1995. British Gas's market share in the business market did fall – by 1996 its share of the market for consumption greater than 2,500 therms per annum was just 29% – and as a result it was left seriously exposed in its long term contract commitments with gas fields. (See Armstrong *et al.*, 1994, section 8.4.3, and Yarrow, 1998, section 2, for more details on these events.)

Premature deregulation: There is obviously an inverse link between the tightness of regulation and the amount of entry. If a market is deregulated when there is still substantial market power present, prices will be high, which may in turn induce a high degree of entry. Given that there is a price/cost margin due to market power, this entry may not be the most efficient. In Britain the clear example of this is electricity generation. Two generation firms historically have largely set wholesale electricity prices. As a result of high prices there, there has been a large amount of entry into generation, largely using gas generators, arguably leading to inefficient excess capacity in the sector.[6]

Favourable terms of access to incumbent's facilities: The final point we discuss is the common practice of granting entrants generous terms for access to the incumbent's facilities (such as gas pipelines, the electricity grid, or the local lines connecting the incumbent's subscribers in telecommunications). Here we just discuss the effects of a low *level* of access charges, rather than an inefficient *structure* of access charges (which is left to the next section). In telecommunications, one major policy dilemma for access charges is that if the incumbent is forced to cover the fixed costs of local network provision partly out of call charges – i.e. if there is an "access deficit" – and if rivals had access to the incumbent's network at marginal cost, then this could over time lead to inefficient cream-skimming with the result that the incumbent would be unable to cover its fixed costs. On the other hand, in the early stages of liberalisation competition is bound to be limited, and perhaps in danger of being stifled altogether. In the early days of the duopoly policy in the Britain, Mercury was explicitly granted favourable access to BT's network, and in particular was made exempt from making any contribution to BT's access deficit (see DTI, 1991, page 70):

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[6] See Armstrong *et al.* (1994, section 9.4.1) and Green and Newbery (1997) for more detail on the interaction between regulation and competition in the electricity market.

"it is reasonable to exempt a new competitor [...] from the [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 the newcomer to compete might be inhibited because of the economies of scale available to the incumbent and competition might never become established."

In terms of its effect on entry, subsidised access prices have a similar effect to allowing the incumbent to charge high retail prices, as discussed above. (Entrants care largely about their available *margin* between retail prices and access charges, not the absolute value of these prices.) The difference between the two policies is that with high retail prices it is consumers who pay for entry assistance, whereas with low access charges it is the incumbent. Either way, though, the likely result will be inefficient entry. Oftel is now of the view that this policy should not be followed (Oftel, 1995, para. 5.10):

"Oftel does not favour using interconnection charges to provide entry assistance but will continue to tackle barriers to entry directly."

4.   Problems associated with the protection of consumers

A number of problems for efficient entry are caused by policies designed to protect consumers. In particular, the kinds of retail tariff that the regulated incumbent is permitted or required to offer will significantly affect the pattern of entry that occurs. We sub-divide the issue into three parts: (i) the effects of average price regulation, which means that there is a <u>negative</u> relationship between prices in competitive markets and prices in monopolised markets; (ii) the effects of prohibiting price discrimination, which means that there is a <u>positive</u> relationship between prices in competitive markets and prices in monopolised markets, and (iii) the effects of the incumbent's tariff not reflecting its underlying costs. The implications of (i) and (ii) are quite contrasting, and roughly speaking with the former there is too little entry and with the latter there is too much. Policies (ii) and (iii) are usually combined in practice – for instance in "universal service" policies that require the incumbent to offer geographically uniform tariffs even when costs differ – but it is clearer to analyse the two effects separately. Problem (iii) is quite complex, especially when access to the incumbent's facilities is an issue, and we discuss the problems with cost-based access pricing and so-called local loop unbundling under this heading.

Average-price regulation: Price cap regulation often takes the form whereby a measure of the <u>average</u> price of a basket of the incumbent's prices is controlled, but the firm has some leeway in choosing the pattern of its relative prices within the basket. While such a system has good features in terms of allowing the firm to make its tariff reflect costs, especially as relative costs change over time, it can also give rise to incentives to react particularly aggressively to entry, a feature that may act to deter efficient entry.

A good example is the balance between local and long-distance call charges in the early years of competition in British telecommunications. BT initially faced competition

almost entirely in the long-distance market (for residential subscribers at least). Because of its average price cap, BT had an additional incentive to cut prices in the more competitive market, other than the usual healthy incentive to compete fairly with rivals – it could use price cuts in the long-distance market to enable it to raise its prices in its captive market for local calls. Indeed, such incentives might be so great as to cause its prices to fall below the associated cost of providing the long-distance service, something that is one of the usual tests for predatory pricing. As a result, competition from rivals might be thwarted even if they are more efficient than the incumbent. In the years 1984 to 1992, BT's basket of regulated services fell on average by 43% in real terms. However, its peak-time long-distance charges fell by 65% over the period, while local call charges fell by less than 20% and fixed charges actually rose a little in real terms. Naturally, much or all of this might be justified by cost-based tariff rebalancing. But Mercury, the competitor, complained vociferously to Oftel that BT's behaviour was anti-competitive (a charge not upheld by Oftel at the time).[7]

Constraints on price discrimination: Policy often involves prohibitions on the incumbent engaging in price discrimination, so that the incumbent is required to offer the same tariff to different consumer groups, even when the scope for competition is greater for some groups than others. This is roughly the opposite policy to average price regulation, in that here if the incumbent lowers its price in response to entry in one market it must then lower its prices in other markets. Naturally such policies will blunt the incumbent's incentive to compete in markets where entry takes place. In particular, rivals who are less efficient than the incumbent may well succeed in their chosen markets because the incumbent cannot afford to compete aggressively with them.

The usual rationale for such policies has recently been re-stated by Oftel (1999a, para. 3.27):

> "As part of the last Price Control Review Oftel set out the principle that those basic elements of telecoms service would be provided at geographically averaged prices so that they are available to all consumers at the same price throughout the country. [...] It has the benefit of ensuring that the benefits of competition in areas of the country where BT faces strong competition are extended throughout the country."

This argument has some appeal, in that prices are then lower in monopolised markets than they otherwise would be. But this benefit comes with the cost of perhaps excessive entry in competitive markets, and anyway one would imagine that consumer protection in the captive markets could be better targeted by direct price regulation. Of course, such a policy also has the effect of assisting entry (see previous section): one would imagine, however, that it is a blunt and ill-focused instrument for doing so.

Incumbent's tariff not cost-reflective: There are numerous ways in which an incumbent's retail tariff can be out of line with its underlying costs. For instance, in telecommunications we might have:

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[7] See Armstrong *et al.* (1994, sections 4.3.3 and 7.5.4) for more details.

- a requirement that the incumbent offers a geographically-uniform tariff even when its costs of providing services differ around the country;
- a requirement that the incumbent offers a balance between fixed and usage-dependent charges better suited to lower-usage residential subscribers than higher-usage business subscribers;
- a requirement that the incumbent charges for calls on a per-minute rather than a per-call basis, when the cost of providing a call is largely to do with call set-up rather than on-going time-dependent costs.

Tariffs that do not reflect costs are one of the most potent source of regulatory-induced problems with competition: a tariff which involves large positive margins in some markets and large negative margins in others will attract, all else equal, an undesirable pattern of entry. A simple example serves to illustrate some of the problems.

Example: Geographically uniform tariffs

Suppose an incumbent firm (say, a postal or telecommunications firm) is required by regulation to offer a <u>uniform</u> price P for providing a specified service anywhere in the country. The country is divided into two broad kinds of region, urban and rural, and the incumbent incurs costs for providing service in an urban area of C_{urban} and in a rural area of $C_{rural} > C_{urban}$. Suppose that $C_{urban} < P < C_{rural}$, and that overall the incumbent makes a reasonable profit, but profits from the urban sector, where it has a positive margin of $P - C_{urban}$ per unit, are used to cross-subsidise the rural market, where it makes a loss of $C_{rural} - P$ per unit. Suppose for simplicity that the two services yield the same level of gross utility to people in both regions, so that the concept of universal service applies to service quality and not just to price, where this utility is denoted U. Therefore, the *net* utility for people in either region is just $U - P$.

This system of cross-subsidy leads to several problems with *laissez-faire* competition:

(a)   *Cream-skimming*: Suppose an entrant has unit cost for the urban service of c_{urban} and provides a service with gross utility u_{urban}. Therefore, it can charge $P + [u_{urban} - U]$ for its urban service and still attract customers. Therefore it will find it profitable to enter that market provided this price is above its costs, i.e. if

$$P + [u_{urban} - U] \geq c_{urban} \ .$$

On the other hand, entry is socially desirable in this market if and only

$$u_{urban} - c_{urban} \geq U - C_{urban} \ .$$

Therefore, whenever

$$U - C_{urban} > u_{urban} - c_{urban} > U - P$$

entry will take place when this is not efficient. This problem can occur when the entrant offers a sub-standard service ($u_{urban} < U$), or when its costs of providing the service are higher ($c_{urban} > C_{urban}$), or both. In particular, if both firms offer the same quality of service, so that $u_{urban} = U$, then the above condition becomes $C_{urban} < c_{urban} < P$. Alternatively, if costs are the same, so that $c_{urban} = C_{urban}$, then inefficient entry occurs whenever $P - C_{urban} > U - u > 0$, i.e. when the entrant offers a substandard (but not too substandard) service. Therefore, there is ample scope for inefficient entry in the profitable markets.

(b)   *Lack of efficient entry in loss-making markets*: Suppose an entrant has cost for the rural service of c_{rural} and provides a service that gives gross utility there of u_{rural}. Then using the above style of argument it follows that if

$$U - C_{rural} < u_{rural} - c_{rural} < U - P$$

entry will *not* take place even though it is efficient. This problem of insufficient entry can occur when the entrant offers a superior service ($u_{rural} > U$) or when its costs of providing the rural service are lower ($c_{rural} < C_{rural}$). In particular, if both firms offer the same quality of service then the above condition reduces to $C_{rural} > c_{rural} > P$. Therefore, there is ample scope for there being a lack of efficient entry in the loss-making markets.

(c)   *Funding problems*: If widespread cream-skimming entry takes place then the incumbent will not be able to fund its loss-making rural service.

In sum, when the incumbent's tariff does not reflect its costs, with *laissez-faire* entry we expect distortions in the form of too much entry in the artificially profitable markets, and too little in the loss-making markets. Issue (c) is not the focus of this paper, but will in practice be an important issue for regulators to deal with, and tends to be the problem that is of most concern to regulators.[8] Some proposed solutions to the above problems include:

(i)   Banning entry, as is the case with basic postal service in most countries, including Britain. This unimaginative policy obviously eliminates all potential benefits from competition. (See section 2 above.)

(ii)   Rebalance the incumbent's tariff to reflect its underlying costs, so that instead of a uniform price, the incumbent's price in the urban market was $P_{urban} = C_{urban}$ and its price in the rural market was $P_{rural} = C_{rural}$. This would solve all three of the problems (a) – (c) at once, and in particular, entry would take place in either sector if and only if an entrant was more efficient than the incumbent. However, this policy is alleged to be politically unacceptable in industries such as post and telecommunications, though this is rarely put to the test. (Other goods and services priced non-uniformly in terms of, for

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[8]   For instance, in its recent consultative document on universal service in telecommunications (Oftel, 1999a), Oftel makes virtually no mention of the problems for efficient entry caused by these kinds of uniform tariffs, and instead focuses on the funding issue.

instance, urban and rural locations, most notably housing, so why should post be so different? Also, in Britain, because of the regional structure for firms in the electricity and water industries, these services are not uniformly priced across the country.) There may be good economic arguments for subsidising the communication services for rural areas – maybe to "bring the country together" in some sense – but this does not imply geographically <u>uniform</u> tariffs.

(iii)   Create a "universal service fund", so that, for instance, the uniform tariff remains in place but all firms – both entrants and the incumbent – pay a tax (on turnover, say) which is used to fund the loss-making sector (which would most likely be provided by the incumbent). This policy is sometimes followed in the telecommunications sector. However, while it does overcome the funding problem caused by cream-skimming entry, it does nothing to help the inefficient entry problems (a) and (b) above. In particular, there will most likely be no significant entry into the loss-making areas, and the efficiency or otherwise of the incumbent there will never be tested. In Britain Oftel currently believes that the incumbent, BT, incurs little or no net cost in providing universal services, and hence does not yet see the need to set up a universal service fund – see Oftel (1999a) for more details.

(iv)   Impose similar tariff and social obligations on entrants as well as the incumbent. In practice, though, this will be hard to achieve: for instance, in telecommunications an entrant could put all its marketing effort into attracting profitable subscribers, and none into the loss-making people, and this behaviour is hard to control. Even if possible, though, it is not obviously desirable – what if an entrant is particularly good at serving just one kind of market, but is forced to serve all markets?

(v)   Use public funds to subsidise the loss-making sector, and leave the profitable sector to manage itself. In Britain loss-making rail services are funded directly out of government funds, and as a result there is no need for there to be distortions imposed on profitable routes in order to fund social obligations. Indeed, one could auction off the right to run these loss-making services to the firm that requires the lowest subsidy (for a specified level of service), which would add a desirable degree of competition for the provision of these services. This scheme has the major advantages that (i) it does not distort profitable markets unduly (although of course additional distortions are imposed throughout the economy in order to fund the subsidy), and (ii) it makes explicit the level of subsidy required, and politicians may find it hard to justify high subsidies, targeted to small groups of people, to the wider electorate. On the other hand, it may be difficult to combine this kind of policy with EU policies aimed at preventing state aids.

(vi)   Finally, a more complex scheme, if it is desired to keep the unbalanced retail tariff in place, is to impose a tax/subsidy scheme that brings the entrant's private incentives to enter into line with those of overall efficiency. Suppose that the entrant has to pay a tax of A_{urban} per unit in the urban market, and a tax of A_{rural} (which may be negative) in the rural market. Then the above analysis shows that entry will occur if and only if it is efficient for it to do so provided that

$$A_{urban} = P - C_{urban} > 0 \quad ; \quad A_{rural} = P - C_{rural} < 0 \; . \qquad (1)$$

For instance, with this tax, entry into the urban market will occur if and only if

$$P + [u_{urban} - U] \geq c_{urban} + A_{urban} \; ,$$

which is precisely when it is efficient, i.e. when $u_{urban} - c_{urban} > U - C_{urban}$. Thus, these entry taxes and subsidies bring entry incentives into line with overall efficiency. It is optimal to discourage entry into profitable markets (in the sense of requiring a positive tax for entry there), and to encourage entry into loss-making markets (in the sense of subsidising entry there). Moreover, the scheme has the additional benefit that if entry does take place in the profitable market, there are still sufficient funds from taxation for the incumbent to continue to serve the rural market. In the economics jargon this tax system is an example of what is known as the "efficient component pricing rule", and it has the feature that the entrant pays a tax (or subsidy) equal to the incumbent's profit margin (or 'opportunity cost') in the relevant market. This system, which in effect means that entrants face the same implicit tax regime as the incumbent, therefore solves at once all the three problems (a) – (c) listed above.

Related issues arise when entrants need access to an incumbent's network facilities in order to provide their own services. An obvious point, but one that is rarely tackled effectively by regulators in practice, is that when the retail tariff is out of line with its costs, allowing entrants access to the incumbent's network facilities at cost (in some sense) will likely to lead to the problems discussed in the example above. That is to say, too much entry in profitable markets; too little entry in loss-making markets, and if cream-skimming entry takes place the incumbent may be unable to fund its loss-making obligations.

In Britain Oftel has been reasonably sensitive to this issue, and has sometimes imposed surcharges onto cost-based access charges – see Armstrong *et al.* (1994, section 7.5.6) for more details about how early policy towards access pricing in telecommunications included significant elements of "efficient component pricing", and thus may have partially corrected various distortions then present in BT's retail tariff. But for telecommunications at the EU level there has been much more emphasis on "cost-based" interconnection charging than there has been on retail tariff rebalancing (about which EU policy currently is vague). This issue will turn out to be particularly problematic if so-called 'local loop unbundling', which roughly speaking involves an incumbent provided many of its network elements to rivals at cost, is mandated throughout Europe.

In the Annex to this paper, I discuss this problem of how to price network elements in the context where the incumbent's retail tariff is regulated. In general an entrant (in, say, telecommunications) has two ways to enter a market: it can build its own infrastructure and be independent from the incumbent, or it can rely more on the incumbent's own investments by leasing/buying some of the incumbent's network elements. The problem for policy is then two-fold: the regime should (i) ensure that entry takes place if and only if this is efficient, and (ii) if entry does takes place the entrant should have the correct

'make or buy' incentives, so that it builds its own infrastructure if and only if this is more efficient than using the incumbent's facilities. In the Annex it is argued that:

- In order to ensure that entry takes place (in whatever form) only if it is efficient, it is necessary to levy an entry tax (or subsidy) of the form in expression (1) above, and this is levied regardless of whether the entrant makes use of the incumbent's network. Otherwise, there will be too much entry in profitable markets and too little in loss-making markets.
- In order to ensure that when entry *does* take place the correct investment decision is made by the entrant, it is necessary to make the incumbent's network elements available at (forward looking) cost. Otherwise, productive inefficiency will result.

Thus, a policy that mandates that the incumbent's network be available to entrants at cost is *half-right*: the correct make-or-buy decision is then made, *given* entry. However, when the incumbent's retail tariff is forced to be out of line with its costs – as with most universal service policies – such a policy on its own will lead to inefficient patterns of entry.

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Technical annex on the pricing of network elements

Suppose the incumbent (in, say, the telecommunications market) already has a network in place.[9] The incumbent has operating costs C for providing services to any given subscriber, has regulated price P for providing these services, and these services provide each of its subscribers with gross utility U (so that their net utility is just $U - P$).

Infrastructure entry: Suppose first that an entrant buys no network elements (such as local loops) from the incumbent, and so builds its network from scratch. Suppose in doing this it incurs costs c per subscriber, which is likely to be substantially above C since the latter only involves operating costs and not the sunk costs of construction. This new network gives subscribers gross utility u, which may be higher than U if a newer technology (e.g. broadband) is being used. Therefore, the entrant can charge a price up to $P + [u - U]$ and still attract subscribers.

Suppose that the entrant has to pay a tax of A for each subscriber it attracts. As in Section 4 above, entry will take place if and only if

$$P + [u - U] \geq c + A \ .$$

On the other hand, such entry is desirable (compared to no entry at all) if and only if

$$u - c \geq U - C \ \ .$$

Therefore, if the entrant is required to pay a fee for each subscriber it attracts equal to

$$A = P - C \ , \tag{2}$$

i.e. equal to the incumbent's 'forward looking opportunity cost', we will have entry if and only if this is efficient. (Of course, this is again just an instance of the so-called efficient component pricing rule as in expression (1) above.) To the extent that P allows the recovery of the incumbent's sunk costs, it is likely to exceed the operating costs C, and hence the "access charge" A is likely to be positive (even though the entrant purchases no network services from the entrant). For many reasonable parameter values (i.e. unless u is particularly high or c is particularly low) there will be no infrastructure entry under the above optimal entry fee regime, for the reason that the entrant has to compete against an incumbent whose network investment has already been sunk.

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[9]   In the following we abstract from other interconnection services – such as call termination payments between rival local operators – to focus on the issue of providing the correct incentives for efficient entry and infrastructure construction.

Entry by using incumbent's network elements: Suppose now that the entrant is given the opportunity to buy/lease some part of the incumbent's network (e.g. its local loops). It costs the incumbent C_A per subscriber to provide this access service to the entrant (which may be close to zero given that its network is already sunk). Given that it has access to the incumbent's network it costs the entrant an additional amount $\hat{c}$ per subscriber to supply its retail service, which then generates utility $\hat{u}$ to its subscribers. ($\hat{u}$ may differ from u if using the incumbent's network degrades or enhances the entrant's own service.) Entry by using the incumbent's network elements is desirable (compared to no entry at all) if

$$\hat{u} - [\hat{c} + C_A] \geq U - C$$

whereas such entry is privately profitable for the entrant if

$$P + [\hat{u} - U] \geq \hat{c} + a$$

where a is the charge for using the incumbent's network elements. Therefore, private and social incentives are brought into line provided that

$$a = C_A + [P - C] \ ,$$

i.e. if the access charge is equal to the direct cost of access plus the incumbent's lost profit in the retail sector (which is again a version of the ECPR). In particular, unless the incumbent's retail price is close to its operating cost (i.e. the cost not including the sunk cost that has already been invested), something that is unlikely, pricing network access at cost seems undesirable if the aim is to achieve (static) efficiency. The above expression is more illuminatingly written as

$$a = C_A + A \ ,$$

where A is as given in expression (2) above. Written this way, the charge for the incumbent's network elements is decomposed into (i) the direct cost of providing access and (ii) the ECPR tax A designed to induce efficient entry.

Giving the entrant the correct 'make or buy' incentives: In this framework, welfare with no entry is just U - C, with infrastructure entry it is $u - c$, and with entry via the incumbent's network it is $\hat{u}$ - $[\hat{c} + C_A]$. Suppose the regulator is unsure which mode of entry (if any) is desirable, i.e. that it does not know the values of u, $\hat{u}$, c or $\hat{c}$ and hence cannot be sure which of these three values for welfare is highest. Is there an access pricing regime that decentralizes the decision to the entrant and ensures that the correct form of entry (if any) is pursued?

The answer, in this simple setting, is Yes. Suppose that whenever the entrant supplies service to a subscriber (either by building its own infrastructure or leasing the incumbent's network elements) it pays the incumbent its opportunity cost P - C. In addition, it may choose to use the incumbent's network elements if it pays the actual cost

C_A for the service. Then this induces the correct 'make or buy' decision by the entrant. It is easily calculated that the entrant's profits under the three possibilities are zero if it does not enter,

$$[u - c] - [U - C]$$

if it builds its own infrastructure, and

$$[\hat{u} - \hat{c} - C_A] - [U - C]$$

if it uses the incumbent's network elements. These profits are just welfare in the three cases (minus a constant), and so with this access pricing regime the entrant will make the entry decision that maximizes welfare, and efficiency is ensured.[10]

Thus we see that, in the simple model, it is correct to allow the entrant access to the incumbent's network at (forward looking) cost – the reason being that it gives the entrant the correct signals about what to build for itself and what to lease – but only so long as the incumbent's opportunity cost is also paid whenever the entrant attracts subscribers away from the incumbent.

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[10] More generally, if there are several different network elements that could be used by an entrant, e.g. switching as well as local loops, then the same argument would suggest that each of these elements be charged at incremental cost, and that the entrant also pay the incumbent's opportunity cost.