

**REGULATORY APPROACHES
TO COST ALLOCATION**

A Report for ORR

Prepared by NERA

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**Project Team:
John Dodgson
Stuart Holder
Sion Jones
Laurent Besancon**

n/e/r/a

National Economic Research Associates
Economic Consultants

15 Stratford Place
London W1C 1BE
Tel: (+44) 20 7659 8500
Fax: (+44) 20 7659 8501
Web: <http://www.nera.com>

An MMC Company

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1. INTRODUCTION

This report, prepared by NERA for the Office of the Rail Regulator (ORR), reviews the economic literature and UK regulatory practice in relation to the allocation of joint or common costs. This follows on from NERA's March 2001 report *Analysing Allegedly Excessive Prices Charged by Train Operating Companies* which stressed the difficulties of:

- assessing train operator profitability at the route level, primarily because of the difficulties of allocating franchise payments and track access charges between routes within a franchise; and
- assessing whether individual fare types on particular trains are excessive in relation to the costs of operating the trains, when most of these train operating costs are joint to the different passengers on the train.

In Section 2, we summarise the relevant economic literature, drawing a distinction between approaches based on the concept of incremental cost, and those using fully distributed costing techniques.

Section 3 then summarises the approaches adopted by UK regulatory authorities, including both the competition authorities and the utility regulators. More detailed descriptions of the approaches adopted by OFTEL, OFWAT and OFGEM are contained in Appendices A to C.

Section 4 sets out our main conclusions.

2. COST ALLOCATION IN THEORY

Cost allocation issues are endemic to economic regulation. As Brown and Sibley (1986, p.44) state:

“One of the everyday regulatory problems in countries where public enterprises must break even is to allocate costs to services for ratemaking purposes. This is not a straightforward task and is the source of many of the most muddled, lengthy and unsatisfactory proceedings in regulatory history.”

Despite this pervasiveness, economic theory has relatively little to say about cost allocation in its own right. This is because cost allocation is merely a means to end, where the end typically involves a mixture of setting prices and/or measuring profitability (either for regulatory or management purposes).

As Cave and Mills (1992) point out, moreover, the question of how to allocate costs would be “trivial” in a world with no joint or common costs, no economies of scale, instantaneous adjustment of all inputs and complete information. In this Section, we focus on the first of these difficulties, and summarise the economic literature relevant to the problem of allocating joint or common costs between different goods or services. There are two broad approaches that we consider:

- approaches based on the concepts of incremental and standalone cost, derived from analyses of efficient, “subsidy-free” or “sustainable” sets of prices; and
- fully distributed cost approaches, of the kind generally favoured by accountants and, until recently at least, used by US regulatory bodies.

2.1. Incremental Cost Based Approaches

The incremental cost of a good or service is the additional cost that a multi-product firm incurs as a result of providing that good or service in addition to its other outputs.¹ To take a simple example of a firm producing two goods, *A* and *B*, the incremental cost of good *A*, $IC(A)$, is defined as

$$IC(A) = C(A + B) - C(B)$$

where $C(A + B)$ is the cost of producing goods *A* and *B* together, and $C(B)$ is the cost of producing good *B* only. $C(B)$ is also known as the standalone cost of good *B*.

¹ Incremental cost can also be used (especially in the context of a single product firm) to describe the cost of a discrete block of output. In this report, we use it to describe the additional cost to a multi-product firm of producing a particular good or service.

If there are no economies of scope, so the cost of producing the two goods together is simply the sum of the cost of producing each good separately, or:

$$C(A) + C(B) = C(A + B)$$

then an incremental cost-based approach will lead to all costs being allocated to either good *A* or good *B*.

However, if there are economies of scope, and so it is cheaper to produce the goods together:

$$C(A + B) < C(A) + C(B)$$

then the incremental costs of the individual goods, *A* and *B*, will be less than the total costs of the firm, ie

$$IC(A) + IC(B) < C(A + B).$$

Thus a cost allocation process based on incremental costs will fail to allocate all of the firm's costs. The difference

$$C(A + B) - IC(A) - IC(B)$$

represents the joint or common costs of producing *A* and *B* together.²

Faulhaber (1975) applied a game-theoretical analysis to the problem of allocating joint or common costs, based on the concept of the core. The core is a set of allocations that cannot be blocked by any coalition (ie a subset of the agents involved) on the grounds that they can trade amongst themselves more profitably. Faulhaber showed that if a monopolist is constrained to break even, and the prices charged to each consumer or group of consumers are less than the standalone costs that would be incurred by efficient producers, then the resulting allocation belongs to the core. Equivalently, this result says that the prices for each consumer or group of consumers lies between the incremental cost and the efficient standalone cost of the relevant products.

This has given rise to the concept of "subsidy free" prices, such that:

- no group of consumers pay more than the relevant efficient standalone cost; and
- each group of consumers pays at least its incremental costs.

² Joint costs (as opposed to common costs) occur when goods *A* and *B* must be produced in fixed proportions. A commonly used example is the joint cost of producing mutton and wool, as it is not possible, in the short term at least, to switch production so that a sheep produces more wool and less mutton, or vice versa.

Sharkey (1982) developed this approach further, taking account of both cost and demand conditions to examine the minimum requirements that will guarantee that at least one set of subsidy-free prices exists.

Applied to network industries, for example, this approach ensures that all users benefit from access to a common network, in the sense that they do not pay any more than they would have to pay for their own dedicated network. Neither do they make anyone else worse off by accessing the network (since they cover at least their incremental costs).

This approach was given additional justification by Baumol, Panzar and Willig (1982), who showed that, under certain cost assumptions,³ this outcome is also a sustainable equilibrium for a contestable multi-product firm. Even if market entry was technically possible, a subsidy free set of prices would not allow an alternative supplier to come into the market and profitably undercut the incumbent's prices for some or all of its products. This outcome is efficient in the sense that, even in a notional competitive market, it is only possible to reduce the price for one output if there is a corresponding increase in the price of other outputs.

The main result of this approach to cost allocation, therefore, is a set of minimum requirements. It should lead to prices for all consumers and groups of consumers that lie between the relevant incremental and standalone costs. An allocation that violates these rules is inefficient, and can be improved upon.

Thus far, therefore, this approach has identified a set of cost allocations that are "wrong", in that they are inefficient. But we have not yet identified a "correct" allocation of any residual joint or common costs. Taking our two good example, depending on the size of common costs, there is a potentially wide range of possible cost allocations that satisfies the above requirements. Indeed, provided both the appropriate incremental costs are allocated to outputs *A* and *B*, then any allocation of the remaining common costs between *A* and *B* will satisfy the requirements of subsidy free prices.⁴

Whether there is a single "correct" allocation of joint or common costs depends on the underlying reason for allocating costs. For example:

- if costs are allocated in order to set cost-reflective prices, then the question of how common costs should be allocated is equivalent to the question of how these costs should be recovered from individual consumers. If the objective is to maximise static

³ The cost function at the monopoly output must feature (at least weak) subadditivity, productive efficiency, least ray average costs, non-decreasing returns to scale and zero excess profit (after rent).

⁴ Strictly, we also need to assume that the firm is efficient for this to apply.

economic efficiency, then the appropriate solution is based on Ramsey pricing principles, with common costs allocated on the basis of relative demand elasticities;⁵

- alternatively, regulators sometimes carry out cost allocations in order to determine access charges for bottleneck facilities. In the case where a vertically integrated supplier (such as a telecommunications operator) must provide network access to its downstream competitors, then the incremental cost may provide a more appropriate starting point, possibly plus a contribution based on the opportunity cost of lost sales in the downstream market.⁶

In other cases, there may be no need to allocate joint or common costs at all. This would apply, for example, if the purpose of the cost analysis was to investigate allegations of cross-subsidy. Demonstrating that all prices are above incremental cost would be sufficient to show that there are no cross-subsidies.

A more sophisticated approach, though with limited practical relevance, is to extend the application of game theory to consider different allocations of common costs. One such method, which leads to “Shapley allocations”, assumes that members join a group (or “coalition”) in random order and are not prepared to pay more than the expected value of the additional cost of their output at the time of joining the group. These expected values are then used as the basis for allocating costs.⁷

Alternatively, Moriarty (1975) has suggested that common costs should be allocated on the basis of each customer’s standalone cost, relative to the sum of standalone costs for the firm’s entire output. While this approach might be viewed as “fair”, it has no theoretical justification and is not necessarily efficient. Indeed, it does not preclude an outcome where some prices are below incremental cost, and it would also impose a heavy informational burden on managers.

2.2. Fully Distributed Costs

In contrast to the approaches described above, methods based on fully distributed costing techniques ensure that all costs are allocated. Where joint or common costs arise, they may be allocated on the basis of several different methods. Braeutigam (1980) identifies three frequently used approaches:

⁵ Where cross-elasticities of demand are zero, then the mark-up (over marginal cost) for each product should be inversely proportional to the own-price elasticity of demand. The analysis is necessarily more complex when cross-price effects need to be taken into account.

⁶ This is based on the “Efficient Component Pricing Rule”, though the optimal mark-up above incremental cost will depend on factors such as the production function (whether a competitor can substitute other inputs for the bottleneck facility, or bypass it altogether) and the extent of any product differentiation - see Armstrong, Doyle and Vickers (1996).

⁷ This description is based on Burns (1994).

- the relative output method – where common costs are allocated on the basis of each service’s share of total output;
- the gross revenue output – where common costs are allocated on the basis of each service’s share of total revenue; and
- the attributable cost method - where common costs are allocated on the basis of each service’s share of total attributable costs.

As fully distributed costing is an accounting-based technique, it is typically also affected by accounting decisions on factors such as depreciation rates and profiles and asset valuation methodologies.

Brown and Sibley (1986, p.49) summarise economists’ view on fully distributed costing (FDC) as follows.

“Economist’s criticisms of FDC have been scathing. They particularly single out the fact that different FDC allocation methods are essentially arbitrary, yet can lead to widely different results. Second, there is no effort in FDC pricing to increase economic efficiency; the important cost concept is not marginal cost, but an “average cost” with no clear rationale. Also, price elasticities of demand have no place in setting FDC rates, except perhaps in forecasting revenue, so FDC prices will generally be much different from Ramsey prices. Finally, economists have argued that FDC methods are utterly meaningless in one of their main uses, testing for cross subsidy. Cross subsidy, logically, should exist only when the deletion of a service benefits users of other services.”

The strength of such criticisms depends, clearly, on the relative importance of joint or common costs. If they are small compared to attributable costs, then the approximations inherent in fully distributed costing may not be serious.

Even if joint or common costs appear to be large, it may be the case that better allocation techniques, such as activity based costing,⁸ can reduce the proportion of costs that cannot be allocated on the basis of an objective analysis of causation. Indeed, Biro and Kay (1994) argue that

“in the case of a large and well resourced organisation, like a regulated utility, and in a context in which the proper allocation of costs is of such importance to the regulatory environment of the industry, the proportion of costs which are not specifically attributed through activities should be extremely small.”

⁸ For an example of activity based costing applied to a UK regulated industry, see Copley (1994). Copley summarises the activity based costing (ABC) approach as follows: “ABC assigns resource costs to activities and traces the activity costs to the services that cause the costs to be incurred”. This can be contrasted with more traditional fully distributed costing approaches, under which resource costs are assigned directly to services.

And where joint or common costs cannot be allocated, Brown and Sibley (1986) show how, under certain conditions, some types of fully distributed cost allocations can be rationalised as being consistent with an “axiomatic” approach to cost allocations, based on a list of “intuitively desirable” features of any cost allocation scheme. Specifically, there is a set of six technical properties of the relationship between cost functions and prices that can only be satisfied by a set of “modified Aumann-Shapley” prices that, given certain cost assumptions, are also equivalent to the outcome of fully distributed costing under the attributable cost method.⁹

Although such an approach does not address the criticism that fully distributed costing does not necessarily promote economic efficiency, it may at least help to deflect some of the criticisms of arbitrariness.

⁹ In summary, these axioms require that the firm must break even; prices should respond to rescaling of outputs; goods with the same marginal cost should be priced the same; a cost function with higher marginal costs than another should lead to higher prices also; plus technical conditions on the additivity of allocations and the correlation between allocations of variable and fixed costs.

3. COST ALLOCATION IN PRACTICE

3.1. Competition Law

Under UK and EC competition law, competition authorities often have to scrutinise the prices and costs of firms that are alleged to have abused a dominant position. Among other things, they may be required to investigate allegations of:

- excessive pricing, such that prices exceed costs by an amount that cannot be justified;
- discriminatory pricing, such that the relationship between prices and costs differs significantly between individual customers or groups of customers; or
- predatory pricing, such that prices are held deliberately below costs in an attempt to force a competitor out of the market.

Though the focus of this report is on the cost allocations that might be used to identify excessive pricing, we briefly summarise the competition authorities' approach to all three of these issues, not least because the second and third have been addressed more frequently and systematically than the first.

3.1.1. Excessive pricing

The Competition Act guidelines on the assessment of individual agreements and conduct, published by the Office of Fair Trading (OFT) define excessive pricing as follows.

“An undertaking’s prices in a particular market can be regarded as excessive if they allow the undertaking to sustain profits higher than it could normally expect to earn in a competitive market. ... All undertakings clearly need to earn some level of profits in order to remain in business and to provide a sufficient return to shareholders and lenders, on whom they depend for capital. The return required by shareholders (the equity cost of capital) is at least the return they could earn elsewhere, having regard to the relative risks incurred by investing in the particular undertaking. Prices within a particular market can be excessive if they allow shareholders to yield a rate of return that is significantly and persistently greater than this equity cost of capital. Similarly, lenders will have their own cost of capital and, by analogy, prices can be excessive if lenders’ returns persistently exceed this level. ...”¹⁰

OFT acknowledges that high prices (and hence supra-normal profits) will often occur for short periods even in competitive markets, and also that firms can sustain supra-normal profits if they are more efficient than their competitors or if they introduce successful innovations. While utilities are subject to sector-specific economic regulation as well as

¹⁰ Office of Fair Trading *Assessment of Individual Agreements and Conduct*, 1999, paragraph 2.6.

general competition law, they may still earn transitory supra-normal profits by improving efficiency or by successful innovation.

Under this approach, therefore, excessive charging occurs when prices are so far above costs that they allow a firm to earn persistent supra-normal profits. In relation to the treatment of joint or common costs, the guidelines state the following.

“A particular difficulty when analysing the prices and profitability of a multi-product undertaking in respect of one or more of its business activities is that certain functions contribute costs to more than one business activity. For example, undertakings will generally have a number of head office functions. These ‘joint’ or ‘common’ costs are those which are incurred in the supply of a group of products, and that cannot be attributed uniquely to one product. To ensure full cost recovery the undertaking will try to allocate common costs between its various services and there are a number of ways of achieving this. Common costs are therefore included in their entirety when calculating the stand-alone costs of an activity. The stand-alone cost assumes that the hypothetical efficient competitor will not be able to cover the common costs from another activity.”¹¹

There are few practical examples of cases where the UK competition authorities have needed to address the allocation of significant common costs in order to investigate alleged excessive pricing. One example is the 1998 Monopolies and Mergers Commission (MMC) investigation of BT’s charges for calls to mobile phones.¹² Whereas BT had allocated many costs on the basis of turnover, the MMC considered that this gave “disproportionately high” estimates of the cost of calls to mobile phones. This was because of the substantially higher turnover per minute for calls to mobile phones, compared with other types of call, primarily because of high payments to other operators (rather than services provided by BT itself). The MMC acknowledged that allocations based on value added or profitability can be justified on causal grounds. While turnover can act as a proxy for these, it was not appropriate in this case because of the effect of high payments to other operators. Most of the costs that BT allocated by turnover, the MMC allocated instead by call minutes, which was both straightforward to apply and gave relatively similar results to cost allocations based on value added. Overall, therefore, the MMC’s approach was to accept BT’s cost allocations where these could be justified in terms of cost causality, but to correct for distortions in other cases.

More usually, excessive pricing allegations are investigated by considering the profitability of the firm as a whole. For example, the recent Competition Commission investigation on supermarkets concluded that the overall profitability of the industry could not be

¹¹ Office of Fair Trading *Assessment of Individual Agreements and Conduct*, 1999, paragraph 2.17.

¹² Monopolies and Mergers Commission *British Telecommunications plc: A Report on a Reference under Section 13 of the Telecommunications Act 1984 on the Charges made by British Telecommunications plc for Calls from its Subscribers to Phones Connected to the Networks of Cellnet and Vodaphone*, The Stationery Office, 1999.

considered excessive over the period 1996 to 1999.¹³ High prices for particular products may also be viewed as possible price discrimination, rather than excessive pricing in its own right.

3.1.2. Price discrimination

In the Competition Act 1998, applying “dissimilar conditions to equivalent transactions” is cited as an illustration of one possible abuse of a dominant position. But the Competition Act guidelines on the assessment of individual agreements and conduct suggest that OFT will apply a relatively flexible approach.

“In general, undertakings will need to set prices above their incremental costs so that common costs, for example, can be recovered. Price discrimination between different customer groups can be a means of achieving this; it can increase output and lead to customers who might otherwise be priced out of the market being served. In particular, in industries with high fixed or common costs and low marginal costs (such as those described above), it may be more efficient to set higher prices to customers with a higher willingness to pay.

A relevant example of this is peak and off-peak rail travel. Charging commuters (who have a higher willingness to pay than leisure travellers) a higher price so as to recover a bigger proportion of fixed and common costs may allow the train operating company to reduce the share of joint and common costs (and hence the prices) for off-peak travellers. This may increase output overall since if both categories of customers were charged the same price, off-peak travellers might switch to another mode of transport or not travel at all. This would leave peak travellers to pay all the joint and common costs. In the extreme, this may lead to both peak and off-peak travellers switching to another mode of transport. In general, price discrimination will not be an abuse if it leads to a higher level of output in the relevant market(s) than could be achieved if all customers were charged the same price. Similarly, charging the same price when costs are different may also be more efficient in some cases.”¹⁴

This suggests that OFT would be sympathetic to an approach based on incremental costs, with common costs recovered through market based pricing (ie an approximation to Ramsey pricing).¹⁵

This flexible approach also has widespread acceptance in the academic community. Writing in 1998, John Vickers (now Director General of Fair Trading, but then a fellow of All Souls College, Oxford) concluded that:

¹³ Competition Commission *Supermarkets a Report on the Supply of Groceries from Multiple Stores in the United Kingdom*, The Stationery Office, 2000.

¹⁴ Office of Fair Trading *Assessment of Individual Agreements and Conduct*, 1999, paragraphs 3.8 and 3.9.

“it seems clear that fixed cost recovery can sometimes provide considerable scope for robust justifications of discriminatory pricing. Indeed, Ramsey principles imply that optimal pricing to recover fixed costs generally entails discrimination.”¹⁶

This approach has also been accepted in the US, where the Interstate Commerce Commission’s 1985 *Coal Rate Guidelines*:

- adopts standalone cost as a ceiling on charges for coal transportation; and
- below this ceiling, accepts the principle of “constrained market pricing” (CMP), a proxy for Ramsey pricing,¹⁷ as a basis for recovering fixed or common costs.

The Commission had originally proposed a maximum rate formula based on fully allocated costs, but this was rejected in 1981 as comments on this proposal had convinced the Commission that “the rates derived from this method would not reflect demand nor necessarily contribute to achieving revenue adequacy. Indeed, we concluded that a meaningful maximum rate policy could not be founded on a strictly-cost based approach”.

3.1.3. Predatory pricing

As with excessive pricing and price discrimination, the EC and UK competition authorities’ approach to assessing cases of alleged predatory pricing maintains a flexible outlook in relation to the allocation of fixed or common costs. Following the famous AKZO case, both the European Court and the Office of Fair Trading hold that:

- prices below average variable cost will normally be presumed to be predatory; whereas
- prices above average variable cost but below average total cost may be predatory, for example if they form part of a deliberate strategy to eliminate a competitor.

In the second of these cases, the authorities will look for signs of predatory intentions and perhaps (though not necessarily) consider whether predation is a feasible strategy for the dominant firm.

¹⁵ While such price discrimination might be acceptable, OFT would still be vigilant against other possible abuses, such as predatory prices or excessive prices across the firm as a whole.

¹⁶ Vickers (1998), page 180.

¹⁷ The Commission states that under constrained market pricing (CMP), “the carriers are expected to use the market demand which they observed as the basis for their pricing, but they need not calculate the precise elasticity of demand for every movement. Indeed, where information on demand elasticity is required under the CMP methodology, we will consider qualitative (rather than necessarily quantitative) evidence on the relative demand elasticity of specific movements and/or commodities. We are satisfied that the constraints and incentives CMP contains should lead to rates approximating Ramsey prices”.

More recently, the European Commission has concluded that Deutsche Post AG was engaged in predatory pricing in the market for business parcel services. This case is particularly relevant, as it relates to a subset of the services provided by a multi-product firm with common costs. Though the full decision has not yet been published, the Commission's press release (dated 20 March 2001) states that

“in order not to be deemed predatory, prices for a particular product or service must cover at least the incremental costs of producing that service”.

Addressing the treatment of common costs, the Competition Act guidelines on the assessment of individual agreements and conduct (paragraph 4.10) state that:

“some undertakings have costs which are common across a number of different activities. If the alleged predation relates to only some of the undertaking's activities, the Director General generally does not include common costs in his assessment of whether predation is occurring because they are not avoidable costs unless the undertaking ceases its activities elsewhere. A large corporation will typically have substantial management overheads which will often be common to all the undertaking's activities. The Director General may, however, expect the undertaking to cover common costs through the activities to which these costs contribute: if an airline offers first class seats and economy seats on a particular flight, and if only the market for economy seats were under consideration, the avoidable costs would be fairly low since the undertaking must continue to operate the aeroplane if it is to sustain its first class business. The Director General might, however, want to verify that the undertaking would cover the avoidable costs of the aeroplane across both the economy and first class businesses”.

Overall, therefore, both European and UK competition authorities appear to recognise that prices as low as (but not below) incremental or avoidable cost may not be predatory. Instead, they may merely reflect a rational, market-based approach to recovering joint or common costs from different markets.

3.2. Utility Regulation

Almost all of the UK utility regulators have had to grapple with difficult cost allocation issues in recent years.¹⁸ Appendices A to C summarise the approaches adopted by OFTEL, OFWAT and OFGEM in recent cases, while Cave and Mills (1992) give some examples of early regulatory practice in the UK.

¹⁸ The main exception is the Civil Aviation Authority (CAA), as airports have been regulated on a “single till” basis. This means that the value of X set for aeronautical charges depends on the expected combined profitability of both aeronautical services and other services such as retailing, so it is not necessary to allocate airport terminal costs between these activities. As part of the current review of airport charges, however, CAA is considering whether regulation should switch to a “dual till” basis, and has commissioned a study of how costs might be allocated between regulated and unregulated activities under such a dual till approach.

The nature of the regulator's task has changed, even during the relatively short history of economic regulation in the UK. The particular problems that arise when network operators are required to provide access to their downstream competitors have led to a formal accounting separation between network and retail businesses in the electricity and telecommunications industries, and a complete structural separation in the gas industry.

Another feature of many of these industries is that regulators now require companies to produce a formal set of regulatory accounts, in addition to the published accounts presented to shareholders. The UK regulators have recently produced a joint paper on the role of regulated accounts (Director General of Electricity and Gas Supply *et al*, 2000), which states, among other things, that attributions, cost allocations and inter-business recharging should be based on a set of principles including cost causality, objectivity, consistency over time and transparency.

It is important to recognise, however, that regulators need to address cost allocation issues for a variety of reasons, and the most appropriate approach may differ from case to case depending on the underlying reason for needing to allocate costs in the first place. There are some occasions where regulators need to be prescriptive (and therefore need to come down in favour of a specific allocation), while in other cases they can merely assess the approach adopted by the regulated firm.

In the next three sections, we briefly review the approaches used in relation to three of the main tasks that require regulators to adopt a cost allocation methodology:

- determining the overall level of prices during the course of a periodic review of regulated charges;
- setting charges for access to a network; and
- setting individual tariffs.

3.2.1. Cost allocation for price cap reviews

A key task for many price cap reviews is to identify the total costs of the firm's regulated activities, as opposed to any unregulated activities. This does not arise in airport and rail regulation, which is carried out on a "single till" basis,¹⁹ but occupies an important place in telecoms, water and energy regulation. The regulator's main aim will be to ensure that the

¹⁹ While Railtrack's access charges for franchised passenger services are regulated on a single till basis, some of the "other" revenues (notably access charges for freight and open access passenger services) are also regulated, and the Regulator may form a view on the appropriate allocation of Railtrack's common costs when considering these other revenue streams. In the case of freight access charges, for example, the Regulator's provisional conclusions state that freight services should not be expected to contribute to the common costs of Railtrack's passenger and freight network.

firm does not load costs into the regulated business that should be allocated to other (unregulated) activities.

More recently, OFWAT and OFGEM have made extensive use of inter-company comparisons, particularly when assessing the scope for future efficiency savings. To facilitate such comparisons, both regulators have drawn up sets of detailed cost allocation guidelines with the aim of ensuring that each company allocates common costs in exactly the same way and therefore the regulatory accounts can be used to carry out detailed inter-company cost comparisons. Inevitably, this requires an unambiguous and easy to implement approach, rather than some of the more analytical but perhaps inexact approaches based on identifying incremental costs.

3.2.2. Cost allocation for access pricing

The setting of network access charges in the telecoms and gas industries (and more recently, electricity) has been heavily influenced by the nature of competition between the network operator and its downstream competitors. In the gas industry, there is now a structural separation between divisions of the former British Gas, whereas in BT's case there is merely an accounting separation between BT's network and retail businesses.

As described in Appendix A, the current approach to determining BT's interconnection charges is based on identifying forward-looking long run average incremental costs (FL-LRAICs) and then recovering any remaining costs through an equiproportionate mark-up over the relevant FL-LRAIC. OFTEL considered other approaches (including "efficient component pricing" and Ramsey pricing), but favoured equiproportionate mark-ups for a range of reasons including simplicity, certainty, transparency and the relatively simple data requirements.

Although OFWAT has not yet decided on the cost allocation methodology to be used in setting common carriage charges, it is at least considering the merits of a more flexible approach based on long run marginal costs, rather than its current, rather prescriptive approach.

3.2.3. Cost allocation for setting individual tariffs

The Rail Regulator's role is somewhat different to that of the other UK regulators, as:

- he is often required to set specific charges for individual customers (ie train operators), rather than merely setting general price limits to apply to all customers; and
- for non-franchised services, his task is generally to evaluate charges negotiated between Railtrack and its customers, rather than necessarily to determine charges himself.

In addition to these, we note that Railtrack does not compete in downstream markets, unlike BT for example.

In keeping with this role, the Rail Regulator has adopted a flexible, market-based approach, originally allowing individual freight charges to vary between incremental and standalone cost, with market forces determining the precise allocation of common costs between freight and passenger services. In his recent provisional conclusions on freight charging policy, moreover, the Regulator has decided that freight services should not be required in future to make any contribution at all to the common costs of freight and passenger services.

Even where the Regulator has been required to set specific charges (for franchised passenger operators), he has calculated the incremental costs associated with operator's services, and then adopted a relatively arbitrary method of allocating the remaining costs between train operators.

4. CONCLUSIONS

The literature review reported in Section 2 above confirms that there is no single “correct” method of allocating joint or common costs. Economic theory suggests a set of minimum requirements (that prices must be between incremental and standalone cost), without which an allocation is definitely inefficient. But it does not lead to a single unambiguous correct allocation. The closest one can get to a “correct” answer is to use Ramsey pricing principles to allocate joint or common costs, but this would be very difficult to implement accurately in practice, especially in situations where cross-price demand elasticities are non-zero (which is probably the case with rail fares).

Where regulators have needed to determine a specific method of allocating costs, they have often resorted to variations on fully allocated costing techniques. To a large extent, this reflects the particular circumstances of the industries concerned, and also the specific tasks being undertaken by the regulators. It is also important to note that such allocations have typically been carried out to derive costs for entire businesses, rather than to determine a detailed structure of prices.

But where regulators have focussed instead on assessing the reasonableness of a company’s own cost allocations, they have tended to adopt a much more flexible approach. This applies to both the Office of Fair Trading and the Rail Regulator, who have both indicated a willingness to accept differential pricing (and, implicitly, market-based cost allocations) in order for a firm to recover its fixed or common costs.

APPENDIX A. OFTEL'S APPROACH TO COST ALLOCATION

A.1. The Context

OFTEL has looked into the allocation of common costs in the context of setting charges for interconnection services.

OFTEL has rejected in principle the use of fully allocated costs for the setting of interconnection charges and adopted forward-looking long run average incremental costs (FL-LRAIC) instead. The main justification for this move lies in the fact that fully allocated costs are unlikely to provide price signals capable of guiding other operators to make efficient market entry decisions (that is to determine when to interconnect and when to build their own network). Prices of final services should be set in a way that encourages consumers to take account of the true costs of what they buy. OFTEL recognised that this would be better achieved by setting interconnection charges based on incremental costs.

In doing so, OFTEL also recognised that a charging system for interconnection services which sets charges equal to incremental cost would not permit even an efficient operator to recover its costs fully as certain common costs would not be remunerated.

OFTEL's approach was to determine the incremental costs of all interconnection services taken together (conveyance) and, separately, the incremental costs of the access network. The issue arose as to what mark-up would be appropriate to add to incremental costs to represent the separate contributions from conveyance and access to the funding of the costs common to both.

In choosing the appropriate approach, OFTEL's main objectives were:

- to set efficient entry signals (particularly signals for efficient investment), and,
- to maximise the transparency and practicality of the approach's implementation.

A.2. Options Considered by OFTEL for the Allocation of Common Costs

Option	Advantage	Disadvantage
The Efficient Component Pricing Rule (ECPR)	<ul style="list-style-type: none"> • Discourages inefficient entry • Allows incumbent to recover common costs (compensated for contributions to common costs which are lost when traffic is substituted by the interconnecting operator) 	<ul style="list-style-type: none"> • May lead to uneconomic bypass (duplication and provision of alternative links at costs above those of the existing network) • In the long term, would lead to less entry than the other mark-up regimes • Complex to implement if modifications to the simple ECPR are carried out to correct for the existence of cost inefficiency, supernormal profits, product differentiation and bypass opportunities
Ramsey Interconnection prices	<ul style="list-style-type: none"> • Tends to push final prices towards economically efficient levels (economic distortion resulting from the need to have mark-ups is minimised if those mark-ups cause the same proportionate reductions in demand for services) 	<ul style="list-style-type: none"> • Substantial information requirements regarding elasticities for different services (not available when the debate took place and estimates based on historic data may not be applicable for future price movements); therefore complex to implement • Not appropriate in a context of unbalanced retail tariffs caused by regulatory constraints (BT's retail tariffs different from those implied by Ramsey rule): could encourage arbitrage opportunity
Equal mark-ups	<ul style="list-style-type: none"> • Clear and transparent regime which allows full cost recovery • Similar to previous arrangements in terms of allocation: would therefore minimise disruption for competitors, and adverse impacts on particular class of customers 	<ul style="list-style-type: none"> • Lacks the theoretical efficiency attractions of the other alternatives • Could provide opportunity for arbitrage as retail prices are not based on equal mark-ups (introduce a discontinuity between interconnection charges and final prices) • Arbitrary in that the allocation of common costs replicates the relative proportion of incremental costs for conveyance and incremental costs for the access network • No built-in distinction between substitute and non-substitute services (no implicit advantage for new or innovative services)

A.3. OFTEL's Conclusion: Equal Mark-Ups

OFTEL found that the advantages of the ECPR approach (limiting inefficient entry and allowing the incumbent to recover common costs) were outweighed by the limitations the approach would impose on the development of competition and by the uncertainty and lack of transparency that it would create in interconnection agreements.

As for the Ramsey approach, OFTEL found that it was compatible with its objective of setting efficient entry signals at both retail and wholesale level, but that it would generate a lack of transparency and would not be practical to implement.

When considering the equal mark-up regime, OFTEL found that the balance of advantages and disadvantages suggested that this could be an acceptable option.

In the consultation process carried out by OFTEL, the industry also showed a general lack of enthusiasm for Ramsey or ECPR mark-ups because of their complexity and because they both depended to a degree on subjective assessments of key elements of the calculations. In addition, another problem with ECPR was that because it would be 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. On the other hand, an equal proportionate mark-up regime, though simple in concept, meant that in practice the structure of charges was determined without any relation to market conditions.

OFTEL has opted for pragmatism, arguing that the chosen framework would have to be easily understood. OFTEL therefore decided that common costs should be apportioned between BT's conveyance and access network activities on the basis of equal mark-up (that is in proportion of the total incremental costs appropriate to each business).

Sources:

OFTEL Consultative Document, *A Framework for Effective Competition*, December 1994.

OFTEL Statement, *Effective Competition: a Framework for Action*, July 1995.

APPENDIX B. OFWAT'S APPROACH TO COST ALLOCATION

OFWAT's principal requirements for cost allocation by the water and sewerage companies in England and Wales are set out in the OFWAT Regulatory Accounting Guidelines (RAGs):

- RAG1: Guideline for accounting for current costs
- RAG2: Classification of infrastructure expenditure
- RAG3: Guideline for the contents of regulatory accounts
- RAG4: Guideline for the analysis of operating costs and assets
- RAG5: Transfer pricing in the water industry

These RAGs provide the basis for the publication of annual regulatory accounts by the regulated companies and also for the information used in OFWAT's five-yearly review of prices. In addition to providing guidance on allocating costs to types of expenditure (such as capital enhancement, capital maintenance and operating expenditure), they provide guidance on allocating costs to activities – water and sewerage services are each separated into a number of sub-services such as water resources and treatment, water distribution, water customer services, etc. There are also guidelines for allocating costs in other dimensions, such as regulated activities and non-regulated activities. The purpose of the cost allocations varies, though they all provide a basis for OFWAT's detailed analyses and forecasts of costs for the periodic review of prices.

In some cases, OFWAT leaves the mechanism for allocating common costs to individual companies to determine, though companies are required to explain the basis for their allocations and to explain the reasons for any changes to their cost allocation mechanisms. In other cases, such as cost allocation by asset type and allocations for the purpose of transfer pricing, OFWAT provides some guidance on the allocation method that should be used.

Some specific examples of OFWAT's approach are provided below.

B.1. Allocations by Service and by Activity

The allocation of costs to the two services, water and sewerage, enables OFWAT to publish "indicative" K factors²⁰ for each service separately, and the allocation by more detailed sub-service activities provides the basis for OFWAT's assessment of the relative efficiencies of the companies.

²⁰ In the water sector, "K" is equivalent to the "X" factor in an RPI-X price formula.

OFWAT undertakes the modelling necessary for the comparative efficiency assessments at the sub-service level, ie there are separate cost models for water distribution, water resources and treatment, the sewerage network, sewage treatment, etc. Although the OFWAT guidelines give detailed lists of cost items that should be allocated to each activity, in practice there is still a fair degree of leeway for the companies in their allocations.

Some common costs are allocated directly to these service provision activities. These include the costs of central support services such as the administrative, personnel and property management functions. OFWAT does not specify rules for the allocation of these costs between the sub-service activities, but does require that companies clearly set out the basis for their allocation rules and explain the reasons for any changes to those rules. Other common costs are allocated to a separate category called “Business Activities”. This is defined to include regulatory items such as the cost of preparing regulatory submissions and the costs of licence fees. Business Activities costs are allocated between the water and sewerage services. As before, the allocation method is left to companies.

B.2. Allocation to Asset Categories

OFWAT requires companies to classify their asset expenditure into various purpose categories such as:

- expenditure on maintaining current levels of service to customers;
- expenditure to comply with new legal quality obligations;
- expenditure to improve the level of service to customers; and
- expenditure on making adequate water and sewerage services available to new customers and on accommodating growth in demand from existing customers.

In RAG2, OFWAT provides guidance on the allocation of costs to these categories where investments may be made for more than one of these purposes:

“Total scheme expenditure should be proportioned across the purpose categories in relation to the relative magnitudes of each element of the scheme. A single physical measure should be identified that is appropriate to all the relevant investment categories in a service area for example, rate of flow, equivalent population or hydraulic capacity.”²¹

²¹ OFWAT, RAG 2.02 Classification of Expenditure, November 1996.

B.3. Transfer Pricing

As water and sewerage companies have expanded their activities outside of their core regulated functions, OFWAT has needed to focus more on its guidelines for setting transfer prices, including the allocation of costs between regulated and non-regulated activities. In the most recent edition of RAG5 (the OFWAT guidance on transfer pricing), OFWAT sets out its most detailed guidance on cost allocation, including:

“The key principle is that costs should be allocated in relation to the way resources are consumed. Allocations based entirely on turnover, volume or direct labour rates should not be used as they are unlikely to reflect the activities involved.....An activity based approach should result in the majority of costs being allocated on a meaningful basis. It is expected that at least 80 per cent of costs will be allocated by activity.”²²

Some more detailed guidance is provided in RAG5 but the application of these principles is left largely for the companies to determine. In this case, OFWAT specifies that short run marginal costing techniques should not be used but that long run marginal costing techniques may be used in some circumstances.

B.4. Introduction of Common Carriage

OFWAT has been encouraging companies to open up their distribution networks for access to third parties as part of a drive to introduce more competition into the industry. There are no specific requirements for charging for access, though company charges need to be consistent with the provisions of competition legislation. Clearly, the allocation of costs between potentially competitive and non-competitive services will be an important factor in the setting of access prices.

To date, OFWAT has given companies some very limited, and rather unclear, guidance on the types of pricing approach that it would consider to be consistent with the principles of competition legislation. On common costs, for example, OFWAT has said:

“...companies need to consider whether costs can be allocated to particular customers or whether they represent a common cost that benefits a wider group of customers.”²³

OFWAT also discusses the possibility of using pricing methods such as long run marginal cost (LRMC) and efficient component pricing, but without being clear about what would be acceptable and how it believes companies should recover common costs under an incremental cost approach such as LRMC. Elsewhere, OFWAT has discussed the

²² OFWAT, *RAG 5.03 Transfer Pricing in the Water Industry*, March 2000.

²³ OFWAT, *Pricing Issues for Common Carriage MD163*, 30 June 2000.

application of LRMC pricing in a range of contexts, including access charges and prices for large users who are outside the price control mechanism:²⁴

“...companies need to find ways of reconciling LRMC pricing with total cost recovery. There are two main approaches:

- i. Set volumetric rates as close as possible to robust estimates of LRMC and allow fixed/standing charges to bridge the gap with average accounting costs.*
- ii. Set volumetric rates closer to LRMC for some customers, leaving other customers to contribute more or less to total revenues than the total costs their demands impose on the system.”²⁵*

OFWAT is planning to consult on the Regulatory Accounting Guidelines during the course of 2001 in order to resolve some of these issues.

²⁴ OFWAT is responsible for ensuring that prices for large users are non-discriminatory.

²⁵ OFWAT, *LRMC and the Regulatory Framework*, MD159, 11 February 2000.

APPENDIX C. OFGEM'S APPROACH TO COST ALLOCATION

Cost allocation methods have not emerged as a major issue in the recent Distribution Price Control conducted by OFGEM as part of the Reviews of Public Electricity Suppliers 1998 to 2000. As OFGEM's December 1999 Final Proposals indicate, each Public Electricity Supplier (PES) distribution business "at present constitutes an effective regional monopoly. In order to protect customers from the potential abuse of monopoly power each distribution business is subject to controls on the prices it can charge and the quality of supply it must provide". At the same time "sufficient revenue must be raised to maintain an appropriate quality of supply, to finance required new investment and to allow an appropriate return to capital providers."²⁶

However, the emphasis in the review is firmly on the level of total revenue that each distribution business can be allowed to earn from its charges, and not at all on limitations on the structure of those charges. Thus issues of the way that different elements of the identified cost base can be recovered from different types of customer are not addressed. The review instead was concerned to assess the level of cost base acceptable to OFGEM using regression-based comparisons of the efficiency of the different distribution companies.²⁷

OFGEM has favoured separation of distribution businesses from other businesses. However, in some circumstances the PES can request a direction to allow its distribution business to share services with other businesses it owns. Three tests must be met for this to be permitted:

- the service must be efficiently provided to the distribution business;
- there is no cross subsidy given to or received from the distribution business; and
- operation of the service does not restrict, distort or prevent competition in the supply of electricity.

The October 1999 distribution price proposals note that there are some cost areas in regard to splitting the businesses where services are presently provided jointly to supply and distribution businesses and where it "would be reasonable to split the costs between the businesses". OFGEM's consultants had suggested a total allowance of £2.5 million for changes to premises, corporate staffing and customer services. Of this, £1.5 million was to be allocated to the distribution business. The basis of this split was not made clear, but the

²⁶ OFGEM, *Reviews of Public Electricity Suppliers 1998 to 2000. Distribution Price Control Review: Final Proposals* December 1999, p.5.

²⁷ NERA has been critical of the way these comparisons have been undertaken, but this is not a relevant issue in relation to the current report.

sums involved are so small as not to materially affect the overall revenue to be raised through distribution prices.²⁸

²⁸ OFGEM *Reviews of Public Electricity Suppliers 1998 to 2000. Distribution Price Control Review: Draft Proposals* October 1999, p.15.

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