

SECTION D

Efficiency, Equity and Consumer Protection

This Section considers the traditional issues of regulation that telecom and other public utility regulators always have been concerned about. On these issues there is a long history of attempts by regulators to develop standards for evaluation and judgement. Determining reasonable prices for monopoly public services is one of the most important. William Melody reviews the history of public utility price regulation, the strengths and weaknesses of the different approaches – including the rate of return and RPI-X methods – and the problems introduced when PTOs are operating in both monopoly and competitive markets.

The introduction of competition and the adoption of the RPI-X method of regulating prices have accentuated quality of service concerns and the need for regulators to develop standards for monitoring and assessing PTO performance on quality of service. Claire Milne reviews the quality of service issues and identifies key indicators that regulators can apply to ensure effective service delivery in monopoly markets. Technical regulation also is changing as telecom markets are becoming more dynamic. Richard Hawkins assesses the changing nature of technical regulation noting that in this dynamic environment, the decisions on standards and protocols tend to be influenced more by non-technical considerations.

Nicholas Garnham reflects on the history of the universal service debate, noting that the empirical evidence on the subsidy cost of universal service indicates that it is quite low. He suggests that universal service is a less significant issue than most participants to the debate claim and is often used as a vehicle to facilitate the pursuit of other objectives.

Chapter 13

Price Regulation and its Implications

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1.0 Introduction

Both historically and currently, the topic that has attracted the greatest attention in the field of regulated industries has been the reasonableness of prices. As a monopoly, or a dominant firm with significant market power, the regulated firm has a market incentive to charge monopolistic prices for a public necessity service. One important task of regulation has been to ensure that the prices charged to consumers are reasonable. This has led to a search for standards by which the reasonableness of prices can be judged. A particular focus of regulation has been on establishing maximum prices for monopoly services. Presumably the maximum prices are the maximum reasonable prices.

Historically, different standards have been used to judge the reasonableness of prices and to establish maximum prices. The methods selected have depended in part on the particular circumstances in which the reasonableness of prices must be assessed. The method currently in fashion, RPI-X, is often called “price cap” regulation. This is not a correct or informative description as all the different methods used to regulate prices involve the establishment of maximum prices or price caps. RPI-X is one method of price cap regulation. This chapter surveys the major methods, analyses the experience in applying them and outlines future pricing issues that telecom regulators will have to face.

Regulators have attempted to judge the reasonableness of prices in telecom and the other public utility industries by evaluating “reasonableness” from four different perspectives or levels of analysis:

- 1) specific individual prices, e.g. the line charge for a residential telephone;
- 2) relations between specific prices, e.g., a residential telephone line compared to a business line or an ISDN line. This raises issues of appropriate rate relations, the design of the rate structure and price discrimination;
- 3) the revenue level of a specific class of service involving several specific services, prices and rate structures, e.g. local telephone services; and
- 4) the overall revenue level of the company for all of its regulated services.

Each approach attempts to develop standards and information that will permit an informed judgement about the reasonableness of prices.

Recognising the inherent imperfections of all real world assessments, reasonableness is sometimes viewed as encompassing a range of possible prices, with

maximum prices for monopoly services being judged as the top of the range of reasonableness. As competition has become more significant, claims are sometimes made that the monopoly PTO is charging prices for special services subject to competition that are too low. In this circumstance regulation and competition authorities are sometimes required to make judgements about minimum reasonable prices.

2.0 Standards for Judging Reasonableness

2.1 Equity

If basic telecom services are judged to be a public necessity to which everyone should have reasonable access, then any standard of reasonableness must satisfy that primary objective. In light of people with low income levels and of the special needs of certain groups in society, such as disabled people, a standard of reasonableness based primarily on equity considerations such as “need” and “ability to pay” has been used to determine maximum prices for a limited number of specific services. These relate primarily to network access and minimum levels of usage. This normally represents a small proportion of the total number of services and prices offered by any PTO.

The effectiveness of such prices is judged by the extent to which universal service is achieved, i.e., the number of people, or proportion of the population excluded from network access at any particular price level. The prices for these basic services should be set low enough so that as few people as possible are excluded from access to the network on the grounds of need or ability to pay. In the case of people with special needs, this may require investment in special equipment. Although this sometimes involves setting some prices below cost, studies in the US, Canada, UK and Australia indicate that this cross-subsidy from other services typically represents only about two percent of total revenues (and sometimes less) in developed economies. In many developing countries the cost of implementing equity pricing can be significantly greater, but is difficult to assess in light of totally underdeveloped telecom systems. For the future, as information society development policies are put into effect in many countries, higher levels of telecom service may become essential for public access to and participation in information society services. If there is to be a universal access policy for basic information society services, the equity standard of reasonableness might require higher levels of cross-subsidy in the future in all countries.

In defining and implementing any equity standard for pricing essential public services, an assessment of the benefit and cost implications must be an important part of the analysis. If equity benefits are to be maximised, they must be implemented efficiently. If equity policies are not justifiable, affordable and sustainable as a beneficial allocation of society’s resources, their implementation is likely to fail. Policymakers and regulators cannot avoid assessing the cost of implementing the equity standard of reasonableness.

2.2 Efficiency

For the vast majority of PTO services, the standard of reasonable prices is the cost of supplying them. The cost standard has an equity justification. It is generally perceived as unfair for a public utility monopoly to charge the public more than it costs to provide a

public necessity service. But the primary justification is economic. It is inefficient to do so. It is a misallocation of society's scarce economic resources.

The economic standard of cost is derived from the economic theory of efficient resource allocation, and in particular the standards of optimal efficiency in theoretically perfectly competitive markets. Clearly if prices are set below cost, there will be no incentive to supply those services in private markets. Either people would be denied services they were willing to pay for, or there would have to be a transfer of economic resources from other important areas so as to subsidise their supply. Historically, PTTs in some countries have set telecom prices significantly below cost, thereby stimulating an enormous demand. But this did not generate the resources to invest in satisfying the demand and governments were unwilling to transfer resources from other important areas. The result was an ever growing waiting list for service. By attempting to apply the equity principle, but ignoring cost and resource requirements, these PTTs could not come remotely close to achieving their equity objectives.

If costs are defined to include all resources, including the cost of attracting investment capital, then there is no need to set prices any higher than cost. This would simply deny the service to those people willing to pay the cost, but not the higher price, and would require a transfer of extra resources from consumers to the PTO for no extra benefit. Consumers would be better off if they could spend the extra money buying something else they wanted. Therefore economic cost, including the cost of attracting capital, is the theoretical standard of economic efficiency.

However, cost is not an easy standard to define or implement. The cost of production by one firm may be a lot higher than another for producing the same service. Clearly society is better off if the service is supplied by the firm that can do it best. Competitive markets provide a powerful incentive for firms to be efficient and to seek ways of improving their efficiency. If a firm is the most efficient competitor it may earn extra profits for a while until the competitors catch up. If it is the least efficient competitor, it will suffer losses and may be driven out of the market. In a perfectly competitive market, the competitive pressure is at a maximum. No supplier produces a significant share of the market, or has power at all to set or control prices. Each competitor must accept the market price and reduce its costs so as to be maximally efficient at that market-determined price. Thus the relevant cost for the efficiency standard is not necessarily the actual cost to a PTO of supplying services, but the cost of supplying them at the highest levels of efficiency. This principle has been illustrated in the behaviour of many PTTs and PTOs in preparing for the introduction of competition. They have reduced their costs significantly, indicating that their former costs were not the cost levels of an efficient supplier.

Cost is often seen as the magic standard for resolving many of the key issues in regulation, including reasonable prices for consumer services and interconnection. Unfortunately this is not the case, as on closer examination one discovers many different cost concepts, definitions, interpretations and methods of measurement, ensuring many active debates. Cost analysis can be shaped to serve a variety of objectives. In reality many attempts to determine cost-based prices in a regulatory setting turn out to be detailed calculations of price-based costs. Costs are used more often to justify prices already selected than to set prices. Thus, on implementation, one cannot avoid the equity dimensions of cost analysis.

2.3 *Improving Performance*

In recent years many countries have taken up the task of reforming PTTs which, by reference to international best practice, were inefficient and lagging significantly in their response to improved technologies and expanding demand. Most already have been, or are to be corporatised or privatised. The primary objective is to get these national PTOs to improve their performance dramatically in a sustained manner over an extended period. The effort is not only to reduce costs to an efficient level, but also to stimulate investment in network upgrading, improved customer service and new service development. Competition is seen as a stimulus, but competition can hardly be expected to cover the entire market, or to provide residential basic service subscribers with competitive market options for a long time. Moreover the PTO often needs time to reform itself to become an efficient, market responsive competitor. In the transition from a monopoly to a competitive market, the key factor is the transformation of the PTO. The objective is to drastically reduce the PTO's monopoly power while at the same time turning it into an efficient and effective competitor.

In this environment it is known that the PTO can reduce its costs significantly if it strives toward international best practice. It is also known that the new technologies being produced in the equipment manufacturing sector provide a foundation for continuous reductions in PTO unit costs. The problem is determining how the PTO can be stimulated to take maximum advantage of these potential efficiencies.

The RPI-X price cap method of regulation was developed to address this transitional problem of stimulating PTOs to become efficient in what it is hoped ultimately will be a competitive marketplace. It acknowledges the PTO is not efficient, and it establishes a reasonable target for expected annual productivity improvement over a future period e.g., three to five years. If the PTO does better than the target productivity improvement (X), it can keep the higher profits that are realised. The implementation of this approach intends to eliminate the effects of general inflation in the economy. Thus the formula RPI-X has been adopted as the particular type of price cap regulation for applicability in these circumstances. RPI represents general inflation as measured by the retail price index, and X represents the overall target for annual productivity improvement. Maximum overall average annual price increases by the PTO are set, i.e. capped, at RPI-X. When the formula was first applied to British Telecom (BT) in 1984, X was targeted at three percent per annum. In the most recent review for the four year period 1993-97, X was set at 7.5 percent p.a. (Xavier 1995).

As the RPI-X formula is applied to the overall package, or basket of regulated services offered by the PTO, it is really an aggregate weighted, average revenue per unit measure that provides a cap on average revenue. It is not a cap on any individual services or specific prices. Therefore, price caps are sometimes set for smaller baskets of services as a sub-component of the overall price cap. This provides the standard for maximum prices for the basic monopoly services. For example, in the initial application of the formula to BT, price increases for residential line rentals were capped at RPI + 2% p.a. Further, as particular services are judged to be competitive services and not in need of special regulatory protection, it is not necessary to include them in the overall basket of services subject to price regulation. In theory, RPI-X regulation will whither away as more and more services are moved out of the basket because of expanding competition. However, experience to date has prompted some regulators to expand the number of

services included in special sub-component baskets and to bring additional services into the regulated basket, not exclude more services from price cap regulation. Since 1984, connection charges, leased lines and international calls have been added to BT's basket of regulated services, increasing the share of its revenue covered by price cap regulation from about 50 percent in 1984 to about 70 percent in 1996. (Armstrong, Cowan and Vickers 1994).

The judgements that are made with respect to the productivity factor, X, and the definitions of the service basket and sub-component baskets are directed toward implementing the objective of stimulating improved performance in an environment where continuous productivity improvement is the industry norm. Thus the RPI-X method is principally about how anticipated efficiency improvements will be shared by the PTO and its stockholders on the one hand, and its consumers generally on the other. As a secondary objective, it is used to cap the annual price increases for consumers of the PTO's basic monopoly services, thereby placing a limit on the extent of annual price rebalancing that can take place.

3.0 Regulation: The Institution and the Methods

There is a great similarity between what is today called "price cap", or in some jurisdictions "social contract" regulation of public utility services, and the method of price regulation applied in the very earliest days of public utilities (more than century ago), particularly in the US. Before regulatory commissions were created, regulation was applied by employing social contracts and price caps. US state legislatures negotiated agreements (i.e., social contracts) with the utilities on a specific structure of maximum rates. The utilities then charged that particular rate structure for a contracted period. The specific rates were maximum rates and were capped as part of the social contract.

It was the collapse of this system that led to the establishment of regulatory commissions, where experts presumably could examine the complex pricing issues on a continuous basis; develop criteria by which the reasonableness of rates could be judged; and deal with the necessary day-to-day price changes under changing industry and market conditions. ("Experts" would be those working with newly created independent regulatory commissions.) Regulation by independent expert commissions was established to bring an improvement on the legislative application of social contracts and price caps (Bonbright 1961).

The fundamental reason legislators abandoned the social contract method of price capping was the magnitude of the task. It was far too complex and time consuming for legislative bodies to get involved for each proposed change to specific utility prices. The task required informed judgement about the industries, their costs, and consumer requirements. Legislators did not have the knowledge, expertise or time to make these judgements effectively. A second reason was the necessity to gather and analyse the detailed information required to justify that particular price changes were reasonable. Some standards or guidelines for judging the reasonableness of prices, and proposed price changes, had to be developed. Then evidence had to be gathered by which one could judge whether any given set of prices was reasonable in accordance with that standard.

The regulatory legislation in almost all countries is very similar with respect to telecom and public utility price regulation. It uniformly says that it is the specific rates charged to consumers that must be reasonable and not unduly discriminatory. It says

nothing about regulating a utility's profits, assessing its rate of return on investment, nor about forecasting productivity improvement in judging the reasonableness of its prices. It is only the specific rates that ultimately must be reasonable. The particular method for judging reasonableness is not specified.

Most regulatory agencies in North America rapidly shifted the focus of their attention from examining the multitude of specific prices to examining the overall profit level, i.e., the rate of return on investment. This was not required by any change in legislation, but grew out of experience. The change in regulatory method came about for the same reasons that prompted legislators to pass the task of judging reasonable prices to regulatory commissions in the first place.

The tariff structures of PTOs and other public utilities are extremely voluminous. There are often hundreds or thousands of different prices in the overall rate structure. If one were to try to make an independent decision with respect to the reasonableness of every particular price and proposed price change, an enormous regulatory bureaucracy would be required. An overwhelming amount of complex and detailed evidence would be required. It was recognised fairly early in the history of regulation that the method of attempting to judge the reasonableness of each individual price simply was not a practical method of regulation. It was too costly, too detailed and required the regulator to become too involved with management issues.

If the historic method of direct price cap regulation was not possible in practice, then what was an acceptable proxy? What was an alternative method for at least getting a rough handle on the problem? There were two main concerns: 1) ascertaining the criteria for judgement in respect to reasonableness; and 2) obtaining relevant information which would allow the criteria to be applied on a continuing basis in a consistent and uniform manner.

As indicated above, economic theory on the issue has been clear and unequivocal for a very long time. The reasonableness of prices is judged in reference to their costs. Prices should be set to cover all economic costs in order to attract the necessary resources. This includes the cost of attracting capital, i.e., a rate of return on investment equal to the firm's cost of capital. Prices in excess of economic costs are unnecessary to serve consumers efficiently and simply result in monopoly profit. Therefore if one is to judge the reasonableness of prices in reference to their costs, how does a regulatory body obtain the necessary cost information upon which to make its assessment?

One approach would be to seek very specific detailed cost information to associate with each individual price. But if that is unrealistic in practice, application of the economic principle at the level of the firm rather than at the level of individual prices would be more manageable and would still allow for an informed judgement on the overall reasonableness of prices. Regulators could examine the aggregate level of revenues, expenses, investment and profit as a first step in judging the overall reasonableness of the general level of rates charged by the regulated utility. After examining the overall level of profit for reasonableness, as a second step, attention could be paid to those particular details of specific rate structures which might need attention, such as the reasonableness of prices for basic residential telephone service, which would represent only a small fraction of the total number of individual prices.

4.0 Applying the Efficiency Standard: Rate of return

4.1 *The Incentives of Cost-Plus Regulation*

Throughout the history of regulation in the US, a system of price (or rate) regulation has evolved in which the reasonableness of prices is judged primarily by the reasonableness of the overall profit level for the aggregate of services within the regulatory jurisdiction. Debates about the criteria to be used for judging the reasonableness of profit of public utility monopolies and the appropriate information to be used in measuring the rate of return on investment have taken place throughout this period before regulatory bodies and the courts. Ultimately, the US Supreme Court has had the final word as to which standards for judgement applied by regulatory authorities are acceptable.

One of the first issues tested was whether the return on investment standard was legitimate as a standard for judging the reasonableness of a utility's prices. The standards selected by the regulatory authorities were required to be within the limits of the law, justifiable in logic and supported by evidence. Return on investment was accepted by the Court as a justifiable standard. In essence the regulator would examine a utility's financial performance in the most recent "test year", make adjustments if necessary to its revenue, expense, investment or income accounts, calculate the rate of return on investment actually earned and compare it with the utility's cost of capital or reasonable rate of return. If the rate of return actually earned in the test year was 15 percent and the cost of capital determined to be ten percent, rate reductions sufficient to reduce the rate of return to ten percent, on the test year data would be required. The utility would not have to give back the extra profit it made in the past, but regulation would require reduced rates for the future.

Historically, there have been protracted debates over the interpretation and implementation of the rate of return standard. During the 1910-1930s era, regulation was criticised for engaging in rate cases that went on for years, in which there were seemingly endless debates about how the investment (or rate base) ought to be valued, which expenses would be included or excluded as legitimate costs, how depreciation would be calculated, how the reasonable rate of return would be calculated, and a number of other factors. Indeed, this was an era when the implementation of rate of return regulation was quite inefficiently implemented because of a lack of clear standards, definitions, concepts and information sources.

Over time the process of applying rate of return regulation became streamlined in several ways. First, a specific methodology came to be accepted for measuring the investment, or rate base. The original cost of investment actually undertaken by the utility for the provision of utility services was adopted by almost all jurisdictions for calculating gross investment. Uniform and consistent depreciation practices were adopted. Rules came to be accepted for the treatment of specific revenue and expense items which would be included in the calculations. Perhaps the most significant contribution to the streamlining process was the establishment of a uniform system of accounts during the 1930s that provided consistent accounting practices and the necessary data to enable regulatory agencies to make informed judgements (Garfield and Lovejoy 1964).

When one examines the process of implementing rate of return regulation today, in most respects it is very efficient. There is very little debate over most issues. And generally it is a simple matter of auditing the information, applying it and engaging in

relatively few debates at the margins of interpretation over amounts of money that are important to the participants, but hardly consequential for the survival and growth of the firm or the long-term development of the industry.

The major item of active and extensive debate in US rate of return regulation today is measuring the cost of equity ownership capital. The financial analysis community is busy with voluminous and complex cost of equity capital studies for inclusion in rate of return cases before regulatory agencies. Yet this element too could be more streamlined, especially when one recognises that the range of difference in the debate is generally more narrow than the standard error of estimate in any of the different measurement methods. The significant issue here is not that the rate of return method is an extremely costly form of regulation to implement. In itself it is not costly. Regulatory proceedings are seldom unduly lengthy or costly when applied by the better regulatory commissions. However, weak regulation can make the process costly, as it can under any regulatory standard, by allowing itself to be manipulated by parties with a vested interest in delay. This, however, is not the fault of the regulatory standard.

The more fundamental issue of concern relating to rate of return regulation is the perverse incentives created by a method that, when applied routinely to a monopoly utility at the level of the firm's overall regulated services, becomes little more than cost-plus regulation. As such, it provides incentives to inflate expenses and undertake inefficient investments; to subsidise competitive services with monopoly revenues; and to use the full extent of the PTO's monopoly power to destroy or restrict efficient competition. In the US and Canada, rate of return became a form of cost-plus regulation that actually rewarded inefficient investments, encouraged anti-competitive behaviour and did not necessarily protect consumers of the basic monopoly service from having to pay excessive prices (Melody 1989).

If one examines studies of AT&T, before divestiture, there is substantial evidence that there was over-investment and "gold plating" in the system. Additionally, there is evidence of a substantial surplus of people, particularly observable in the enormous number of lobbyists and monitors of legislators, regulators and other participants in the regulatory process. But following divestiture, there were massive cost reductions by AT&T, by its manufacturing affiliate (recently spun off as Lucent Technologies) and by the Regional Bell Operating Companies (RBOCs). Divestiture and increased competition, it would seem, has had a significant effect in overcoming the perverse efficiency incentives created by rate of return regulation. Whether the perverse efficiency incentive remains a significant issue in today's more competitive US telecom environment is, of course, a debatable point. It is clearly a lot less significant now than it was before the AT&T divestiture. However, it may still be a powerful force for the RBOCs which have retained a monopoly over local telecom services which will remain until the *Telecommunications Act of 1996* can be fully implemented.

4.2 *The Anti-Competitive Cross-subsidy Incentive*

In contrast, the cross-subsidy incentive provided by rate of return regulation clearly exists today. It may even be more significant in a more, but not fully, competitive market environment. As long as the dominant carrier (e.g. AT&T, the RBOCs in their respective territories; or most national PTOs) is regulated on a rate of return basis, it can reduce prices in competitive markets with impunity, knowing that the profit, which otherwise

would have been lost to the company, will be made up from its monopoly markets immediately. In fact, such a pricing policy can be expected to help protect market share from competitive inroads, require increased investment and provide justification for a higher absolute level of profits. The perverse cross-subsidy incentive remains a serious problem.

In the US, regulators have been trying for the last 30 years to do something about this problem. The FCC has undertaken a series of cost studies over the years attempting to allocate AT&T's aggregate costs among its major service categories. This would extend regulation beyond the overall rate of return to a more detailed level of return by major service categories, of which some are monopoly and some are competitive. This allows rate of return regulation to be applied on a service-by-service basis, thus going a long way toward neutralising the perverse cross-subsidy incentive and also having a beneficial effect on the efficiency incentive.

One of the first major cost of service studies of this kind in telecom was completed by AT&T for its interstate services subject to FCC regulation. The study analysed AT&T's interstate services in seven classes for 1964. The results showed that AT&T's basic public monopoly message telephone service was earning at a rate about 40 percent greater than the maximum allowable overall rate of return (10.50% v. 7.25%), and that several of its special services where consumers had alternative possibilities (e.g. bulk capacity transmission for large organisations) were suffering losses. This study led to a series of investigations and studies by the FCC which addressed cost principles, methods and data, and the development of cost of service accounting manuals. But the FCC did not follow through and establish these accounting and reporting systems as part of its on-going regulation of maximum rates for the basic public telephone service.

During the 1970s, the FCC adopted an alternative policy of "structural separation", by which it would require AT&T to establish separate subsidiaries, divisions or operating units for its competitive services. This, it was believed, would simplify the cost analysis and pricing assessments. The basic method of regulation on the cross-subsidy issue would be to require a formal separation of competitive and monopoly activities. It was hoped this would avoid many of the problems of cost allocation. However AT&T found the functional separation to be cumbersome to implement and claimed it imposed inefficiencies on the company, especially as services would shift from monopoly to competition as market conditions changed. During the 1980s, the FCC decided to give up on its structural separation policy and return to cost of service standards as a basis for attempting to judge the reasonableness of prices for particular categories of service, but limited the number of service classifications to four broad categories as a means of simplifying the cost allocation problem and making the process more manageable. However, the categories are so broad that they are not an effective tool for identifying and preventing pricing below cost for competitive services, or above costs for monopoly services (Melody 1989).

The US regulatory experience in telecom has exposed the limitations and weaknesses of rate of return regulation as a basis for judging the reasonableness of prices. In addition, it confirms the longer term experience in regulation generally, that attempts to apply any standard for judging the reasonableness of prices at the level of detail and precision that theory would require, have been ineffective. Whether this is due to the limitations of the theory for real world application, the weakness of the regulatory

institutions, or both, is a matter for serious analysis in the design of new regulatory structures. (For developments in Canada and the UK during the era when competition issues became significant see Bigham, and Cave, this volume).

5.0 RPI-X – A Standard for Improving Performance

5.1 The Early Experience

The purpose of price regulation is to establish maximum prices or to place a cap on the prices charged to consumers for monopoly telecom services. Rate of return regulation is a particular method that has been used for a long time by regulators as a basis for making judgements about the reasonableness of those prices. The RPI-X method is a more recent method now being implemented in telecom in a number of countries, and also in other public utility industries in some countries.

Part of the rationale for developing the RPI-X method in the UK in the early 1980s was the recognition that the rate of return method did not provide a strong incentive for efficiency when applied to a public utility monopoly, and did provide a positive incentive for anti-competitive cross-subsidy. In the UK circumstance there was compelling evidence that the telecom operations were quite inefficient. As a government operation that was a part of the Post Office Department, it had not operated on business principles. Its revenues went to the Treasury and were used to subsidise the post and other government operations. Investment funds had to be sought from the Treasury in the annual government allocation of resources. By making BT a private corporation the intention was to bring about substantial improvements in operating and investment efficiency. It was felt that what BT needed most of all was a strong incentive to bring about large efficiency gains that were there for the taking if it were simply run as an efficient business. By rejecting rate of return regulation, and by adopting the RPI-X method, it was felt BT would have maximum incentives to improve efficiency.

In implementing the RPI-X method for determining maximum price increases (or decreases) allowable in any particular year, it does not appear that the three percent productivity improvement figure initially adopted for BT for the 1984-89 period was based upon any substantive analysis estimating BT's past, present or future productivity. Apparently it was negotiated between BT and the government without reference to productivity estimates. During the first year, the RPI increased slightly less than seven percent. BT increased local residential rates by about 8.9 percent, a shade less than the maximum permitted of RPI + 2%. BT restructured its long distance rates with some increases (primarily for shorter distances) and some decreases (primarily for longer distances). The rate increases averaged about three percent overall. Since these-rate changes were within the guidelines allowed by the RPI-3 formula (i.e., 7%-3%), they did not have to be justified. There was no basis for the regulatory agency to take any action other than to verify the calculations.

With respect to operating efficiency, there were no major cost reductions by BT on the order of those implemented by AT&T and the RBOCs after-divestiture. Although there were some reductions, some analysts indicated surprise that there had not been any major cost reductions, either in labour or management.

In the early years of implementing RPI-X both the financial press and OFTEL expressed serious concern about potential anti-competitive behaviour by BT. The OFTEL

Director General expressed increasing concern about problems with interconnection with the new competitor, Mercury, and threatened to take action unless BT started providing better and more rapid connections. Value-added network service (VAS) suppliers complained continuously that their opportunities in the market were being foreclosed by BT's monopoly behaviour as reflected in interconnection practices, price discrimination and the use of customer and competitor information to gain unfair advantage. According to industry reports, there were very few VAS, and BT had maintained a near monopoly position in those markets also. In addition, quality of service had declined to the point where public complaints had become pervasive, including both residential and business users.

Under the RPI-3 formula, BT profits increased substantially, to the point where the Director General of OFTEL publicly expressed concern that BT's rate of return was getting embarrassingly high. He noted that if it got any higher he might have to call for a review of the RPI-3 formula before the established five year period had run its full course. After several years of very high reported rates of return (in the range of 18-23 percent), a financial analysis of BT by *The Guardian* concluded: "Unfortunately, this analysis hammers home the uncomfortable point that if such an inefficient company can make such good returns surely prices must be too high. Shareholders might like to ponder that one as they phone their friends and relatives to discuss the size of the dividend check." During this period local residential service was extended from about 60 percent to 80 percent of households, but BT's prices for local residential service were also increased to levels that ranked among the highest in the OECD countries.

One might ask whether there was anything in the UK experience applying the RPI-X formula that would indicate the behaviour of the dominant regulated firm (BT) was markedly different from what one would expect in the US under rate of return regulation. On the basis of the early experience, it is difficult to observe any significant differences.

As the UK, and in particular OFTEL, got more experience in regulating BT, it was possible to stimulate BT to demonstrate efficiency improvements by a series of more proactive regulatory activities. These included gradually increasing the value of X to its current level of 7.5 percent, imposing quality of service standards with financial penalties, playing a more active role on interconnection and access issues, and engaging in a more detailed monitoring of performance, among others. Although competition has been extremely slow to develop, the overall efficiency of the UK telecom system has improved dramatically. However, the primary driving force behind the improvement was not the RPI-X method of price regulation; rather it was informed proactive regulation applying a number of different standards. The RPI-X method of price control facilitated the process, along with quality of service standards and other regulatory tools. But informed proactive regulation was necessary to make them work effectively.

The UK experience in applying RPI-X demonstrated that it is not really a substitute for rate of return regulation, but rather a different standard. Indeed, OFTEL, investment analysts and others quickly came to judge the effectiveness of RPI-X by examining the rate of return that was realised. The application of RPI-X ought not to permit high levels of monopoly profit, nor deny the firm an opportunity to earn a reasonable return on its investment. Thus, in a sense, the RPI-X method is an indirect proxy for rate of return. Rather than establish a reasonable rate of return by direct

examination of rate of return and cost of capital data, RPI-X attempts to achieve a reasonable rate of return but at an improved level of efficiency. But in attempting to apply the RPI-X method, a number of new uncertainties are introduced. Thus the US FCC and some other regulatory authorities that have adopted RPI-X, have also retained rate of return as a benchmark for monitoring its effects.

5.2 *Theory and Implementation*

The economic theory behind rate of return regulation is universally accepted as correct and precise. Its failings are in implementation and can be summarised as follows:

- 1) it can create powerful incentives for inefficient and anti-competitive behaviour;
- 2) information cannot be obtained that would enable judgements to be reached about whether the regulated firm is operating at optimal efficiency; and
- 3) in the telecom sector, at least, it has not been implemented effectively at the level of individual prices or homogeneous service categories.

The theory and practice of RPI-X must be assessed to determine its strengths and weaknesses as a method for judging reasonable prices. Its economic logic is straightforward. The inflation adjustment allows price regulation to be applied in economically *real* rather than monetary terms. The productivity deduction ensures a sharing of the efficiency gains with consumers generally. But like all methods, it creates a particular incentive structure and runs up against difficulties in implementation.

5.2.1 *Inflation*

According to the RPI-X method, the PTO should be permitted to pass on to customers the cost increases caused by general inflation in the economy which are obviously not under the control of the PTO. The best measurement of general inflation is the RPI (in some countries called the consumer price index, CPI) which is widely accepted as a valid measure of inflation. Nevertheless forecasting the annual increases in RPI for a future three to five year period is a very uncertain business, considering that quarterly reports of actual inflation are eagerly anticipated by analysts so they can adjust their annual forecasts. Thus, in applying the RPI-X formula, regulators and PTOs have never made their RPI forecasts public, and some analysts doubt they were ever made.

The weakness of using the RPI is that the PTO incurs an inconsequential portion of its costs in retail markets, so the RPI, as a measurement of the impact of inflation on the PTO's cost structure, is an extremely poor indicator. Theoretically a special telecom index should be constructed from the structure of purchases made by the PTO or the telecom services sector to measure the inflation impact on the PTO cost structure. But a generally accepted telecom index does not exist, and if constructed might even indicate a deflationary rather than an inflationary adjustment, as it would incorporate all the productivity improvements and declining unit costs in the telecom and information technology equipment and services that the PTO purchases. For example, the vast reduction in unit costs of fibre cable of ever expanding capacity provides a significant deflationary cost reduction for purchases by PTOs, but this is not included in the RPI basket of items which consumers generally purchase.

In fact, RPI measurements generally do not include the effects of many of the new technologies that consumers do purchase. All methods for estimating inflation have difficulties incorporating the effects of new technologies. An increasing body of research has demonstrated that official price indices tend to overstate the rate of real inflation. New goods and services generally are not included in RPI measures until they have been on the market for several years, thereby omitting the rapid decline in prices that usually takes place in the early years of new products and services. For example personal computers were not included in the US consumer price index until 13 years after the first ones came on the market and prices had been reduced many times. One recent study estimates that the US inflation rate has been overstated by an average of two to three percent p.a. since 1974, primarily because new products and product improvements have not been included when introduced (Nakamura 1995).

As a result, not only is the RPI a poor measure of the annual rate of inflation experienced by the PTO, but also changes in the RPI are likely to have little relation to inflationary changes in a PTO's costs. The RPI in any country may be sensitive to international market prices in oil, forest products, agricultural commodities, import tariffs and taxes, wage negotiations in major manufacturing industries, the level of government expenditure and the international value of the currency. These factors have no relation whatsoever to the efficiency performance of a PTO and are certainly not under the control of the PTO. Whether the PTO gains or loses as a result of changes in the RPI inflationary adjustment, it will be a windfall gain or loss, and it will have no discernible effect on incentives for improving efficiency.

Nevertheless few PTOs are likely to complain as the RPI inflation rate will significantly exceed the telecom services sector inflation rate for the foreseeable future. The only real issue is how great the windfall gain will be. As a rule, the greater the general inflation rate, the greater the windfall gain for the PTO unless currency stability is affected and international transactions are important. Ironically, basic residential telephone prices are included in the RPI measurements of most countries. When a PTO increases these prices, they will contribute to inflation, but when it reduces prices for competitive business services, they are not included in the RPI inflation measure. Thus a cross-subsidy incentive is created by application of the RPI-X method that is very similar to that which arises in applications of the rate of return method. In both cases, the PTO can justify higher overall prices by engaging in a cross-subsidy strategy in designing its overall pricing structure. However the significance of the cross-subsidy is not nearly as great under RPI-X as under rate of return.

In the course of applying the RPI in a number of developed countries in recent years, the inflation rate has been quite stable and relatively low. It has not had a significant influence on the application of the RPI-X formula. The weaknesses have not been exposed and the focus of debate has been on the productivity "X" factor, which can compensate for some of the limitations of the RPI inflation adjustment. But this will become increasingly difficult if inflation rates increase significantly or if significant foreign investment is involved. In particular, the application of RPI-X in developing countries should be undertaken only after detailed analysis of its implications under the specific conditions in each particular country. So far the RPI has been an off-the-shelf, stable, harmless reference point for easy practical application in the price regulation process. But as it has no theoretical foundation, its application must be justified by

special circumstances requiring simplicity and only crude indicators to facilitate a fundamental transformation in PTO efficiency. Even here, the formula might be more effectively applied in the telecom industry if the inflation factor were simply omitted from the formula.

5.2.2 *Productivity: The X Factor*

In contrast to the inflation factor, RPI, which measures a weighted average of inflation in the whole economy, the productivity factor X, is intended to reflect forecasted specific productivity, or efficiency improvement by the PTO. Although partly within the control of the PTO, it is not entirely. PTO management determines its organisational structure, employment, purchasing, investment and service development policies, all of which affect its operating efficiency. But the major source of a PTO's productivity improvement comes from its investment in new information and communication technologies that are purchased from other firms competing in equipment, software and service markets. Should a regulatory formula reward or penalise a PTO because of productivity improvements (or the lack of them) in upstream industries from which the PTO is a major purchaser?

In adopting the inflation minus productivity formula the US FCC suggested it may attempt to refine the formula so that productivity would include only those elements of productivity specifically attributable to the activities of the regulated firm. This would be a measure of partial productivity that would require an allocation of costs between attributable and non-attributable categories (Federal Communications Commission 1992).

The economic theory of productivity has never been a settled question in the same manner as is rate of return, especially with respect to the attribution of causes of productivity improvement. Improved labour productivity is primarily determined by investment in new technologies. Total factor productivity can be measured in different ways and in telecom is primarily due to technological advance in the equipment sector. Clearly, there is ample room for legitimate debate on both the theory and measurement of productivity, let alone the attribution of the causes of productivity improvements.

But there has been almost no public debate on the appropriate productivity measurements to use in regulating telecom PTOs. There have been few productivity studies made public that were used to guide the establishment of the X factor. Indeed in most cases it would appear there were no productivity studies even undertaken. Determinations of the X factor have not been subjected to independent critical analysis or public hearings in the manner that rate of return has. The X factor has been the result of closed negotiations between the PTO and the regulator. The issue has not been over the appropriate measurement of productivity, but over what productivity number would be acceptable to both sides. The primary reference point as to whether X should be increased or decreased has been the rate of return actually earned in the immediately preceding period. The primary reason that BT's productivity factor was increased from three percent to 7.5 percent between 1984 and 1993 was because its rate of return was at an embarrassingly high level during much of this period. It has not been suggested that these numbers are based upon independent studies of actual or forecasted productivity improvements by BT, or that BT's forecasted rate of productivity improvement in the 1990s is 2.5 times what it was in the 1980s.

The productivity X factor is supported by a less rigorous theoretical justification than rate of return and portends far more serious problems of measurement. It provides ample room for the application of flexibility and judgement in the negotiations. Its weaknesses have been protected to date by insulating the details of its application from independent public scrutiny. As such it has given regulators a vehicle for negotiating price caps for monopoly services in a very favourable climate where dramatic technological improvements are driving improved economic performance. Informed and savvy regulators have been able to use it to good effect. It is not a tool for weak, uninformed or inexperienced regulators.

6.0 Future Pricing Issues

In evolving telecom markets characterised by imperfect competition with dominant firms, the priority pricing issues for future regulation will be the following:

- 1) ensuring reasonable maximum prices for residential consumer access both to basic telephone services and to other information services that, over time, will become essential to living, working and consuming in an information society. This will require attention to additional services that may need to be added to the basket of essential public services, and to the pace of diffusion of those services across the population so that universal service objectives are achieved;
- 2) establishing standards for judging the reasonableness of minimum prices in competitive service markets. The incentive to engage in anti-competitive behaviour will remain strong for the dominant firms. Claims of anti-competitive behaviour will increase. If vigorous and fair competition is to be encouraged, clear standards for minimum pricing must be established and monitored as part of on-going regulation;
- 3) establishing basic principles and standards on aspects of telecom service rate structures that satisfy, or fail to satisfy the objectives of 1) and 2) above. As new information services grow, and competition becomes more sophisticated, both competitive advantages and monopolistic restrictions will be reflected increasingly in the design of rate structures for particular services. This will be an especially difficult issue as active competitive markets should be characterised by flexibility and experimentation in pricing as part of new service development. Regulation will have to seek to establish standards that will prevent monopolistic restrictions from being established in dominant firm rate structures, but at the same time will encourage appropriate price flexibility and experimentation.

6.1 Maximum Prices for Basic Services

Neither traditional rate of return nor RPI-X regulation are very effective standards for application in the future environment. Overall rate of return regulation was developed to prevent monopoly public utilities, operating in a stable market environment, from earning monopoly profit. RPI-X has been developed to stimulate the transformation of PTOs into efficient competitive organisations. These measures have been applied at the level of the PTOs overall regulated operations. Future regulation must be more specifically focused.

If rate of return regulation is to be applied to setting maximum prices for residential consumer access, it will require the development of a reasonably detailed cost methodology to enable calculations of the rate of return for the specific residential services basket. Although cost of service studies for individual services are a common practice in many industries, their application in telecom regulation has been very limited to date. However, given the new incentives of telco managements to want to identify their specific profitable and unprofitable services, regulatory agencies could investigate the possibilities for developing a more refined and updated application of rate of return regulations, but applied only to the basic monopoly services. Given the US experience with rate of return regulation, built-in time lags should be employed to ensure cost-plus incentives are not created.

For the RPI-X method to be applicable for setting maximum prices for basic monopoly services, it would have to be measurable at the level of the basic residential service basket. It is difficult to see how a productivity improvement, X, could be measured for these services alone. However, since X is determined by negotiation, not measurement, a general guideline that could be considered is simply to apply the RPI-X formula directly to the essential monopoly services. This would ensure these services benefit at a level equal to the average anticipated productivity improvement for all services. If the PTO can do better than this in its competitive services, it would realise higher than forecasted profit levels from superior performance in competitive markets. But this is likely to raise debate over whether basic residential services are being subsidised and may require detailed cost of service studies to find out.

6.2 *Minimum Prices for Competitive Services*

With respect to establishing standards for judging minimum prices on claims of anti-competitive pricing, neither rate of return nor RPI-X are very helpful. The RPI-X method neither addresses the issue of minimum rates nor generates data that would be useful in developing a cost standard for judging minimum prices. If the rate of return method were refined and used as a basis for judging maximum rates for basic residential services, the same cost of service data sources could be used to develop minimum cost estimates. This would ensure consistency in the use and application of PTO cost data, which has been a serious problem in US regulatory history. But it would require the development of a specific cost methodology for measuring the appropriate cost standard for judging minimum prices. Such a standard will need to be developed in any event, if not by telecom regulators, then by competition authorities or courts.

There is no universal agreement on what cost standard – average variable cost, average total cost, long-run incremental cost, short run marginal cost, fully distributed cost, actual book costs, forecasted costs, etc. – should be applied in judging minimum prices. This is partly because the appropriate standard depends upon the circumstances and the intent of the dominant firm. If regulators do not specify their standard(s), then both the dominant firm and the new competitors will be operating in an uncertain environment that could have a stultifying effect upon the dynamism of competition and stimulate attempts to manipulate the regulator. Thus if telecom regulators can establish in advance the standards they will use in judging minimum rates for competitive services, and the data sources they will use in applying these standards, all parties will know the

rules of the game. More informed competition and more efficient competition and regulation will be the result.

6.3 *Principles for Designing Rate Structures*

The same telecom facilities network is used to provide an increasing variety of services, some by the PTOs and other telcos, some by VAS suppliers, some by resellers and retailers, and some by large institutional users for their own diversified activities. All operators, and all users would prefer rate structures optimally designed to serve their specific needs and interests. As these frequently conflict and change, as circumstances change, serious disagreements with significant implications for competition and new service development can be expected to arise.

Monopolies often prefer that customers pay high fixed charges as a way of minimising the risk associated with their actual use of the services to which they subscribe. But monopoly PTOs have never been too keen on leasing lines to competitors or large business users who are capable of using the capacity of the lines at a higher level of efficiency than the PTOs. They would prefer to charge usage rates so they can benefit from the increased usage, especially if it may require additional costs elsewhere in the PTO network.

Consumers in different circumstances will prefer different rate structures. They do not wish to pay fixed charges for capacity and services they do not use. Yet most do not like the uncertainty of not knowing what their telephone usage charges are going to be. In a competitive market consumers will be provided with a choice of rate structures so they can select the one which best serves their circumstances. In markets where competition is highly imperfect this can raise complex issues of price discrimination and anti-competitive rate structure design.

In the early days of telephone service development in the US and Canada, the use of a fixed access charge for local telephone service with no charges for usage gave the telcos a more secure and predictable flow of revenue and provided a significant barrier to entry for potential competitors. However, this rate structure gave consumers a degree of certainty about their telephone bills and stimulated usage because the access charge was affordable for most households. It has been recognised as a key factor in promoting the widespread penetration of telephone service at an early stage, and the fact that North Americans make more than twice as many calls per person as any other country.

After the divestiture of AT&T during the 1980s, the FCC approved a restructuring of US interstate long distances rates, lowering the usage rates but imposing an additional access charge on all telephone subscribers. This stimulated long distance calling, facilitated competition and provided major benefits for high volume long distance callers. It disadvantaged small volume callers, and the significant portion of people who make no interstate long distance calls at all, and in some poorer states led to a decline in the universal service penetration rate.

The rate structure issue that will soon become a major regulatory problem relates to the use of the telecom facilities network by increasing numbers of VAS suppliers, the new competitors that are expected to lead the development of new information society services. They typically lease telecom network capacity and apply their computer-based skills and software to using that capacity more efficiently and effectively than most PTOs

ever imagined for new services. Some of these have a potential capability to compete with the established services of the telcos, including voice telephony services.

The most dramatic example of this development to date is the Internet. Its phenomenal growth has been stimulated by a highly efficient use of telecom transmission capacity, free local access connections to most users and an expanding array of accessible services, many free. The traffic patterns for Internet use can be very different than for voice telephony, thereby imposing new, and sometimes unanticipated demands on the system. In some areas of the US and other countries, PTOs are having difficulty establishing additions to capacity which keep pace with Internet demands. In certain areas, customers for public network service are experiencing busy signals more frequently. The FCC's Network Reliability and Interoperability Council is monitoring the impact of Internet traffic growth on the US public network and considering possible actions that may be needed by the industry or the Commission.

The US LECs see the problem as primarily one of free access to the Internet because most local services do not have usage charges. New usage charges are needed, particularly for local network access, to slow the growth, ensure cost recovery and provide additional funds for expanding investment. Yet the telcos are earning very respectable rates of profit on rate structures that were considered reasonable before the unforeseen Internet usage growth. The LECs are advertising, with considerable success, residential subscription to a second line for Internet access. About 16 percent of US households have more than one telephone line. By the year 2000 it is estimated this will grow to 35 percent. It is a major growth area providing significant additional telco revenues.

In those countries where the explosive Internet growth problem has not yet become significant, a major factor has been PTO or government restrictions on competition and the provision of access lines, plus significantly higher prices. A 1996 OECD study concludes that the penetration of Internet hosts is five times greater in competitive than monopoly markets, and the tariff rebalancing now occurring in monopoly markets is making the local charges in these countries even more expensive relative to those in competitive markets (OECD 1996).

In all countries the development of Internet and other online and VAS will create increasing pressure for a fundamental reassessment of traditional telco rate structures. A major confrontation is looming between local telco operators and the information service suppliers, who will be supported by the computing industries and many millions of Internet users. The telcos will want to establish new usage charges on the developing information society services traffic to avoid, they will claim, subsidising their competitors. The information sector will attempt to prevent or restrict new usage charges so as to maintain a fertile environment for the development and use of, and experimentation with their information services. They will charge the telcos with anti-competitive pricing that will stultify the development of new services, restrict teleworking and promote a concentration of information services and business activity in a limited number of urban areas. In many countries, telecom regulators will be directly involved, if not responsible for, the resolution of this rate structure problem, as well as others, as telecom rate structures are redesigned to reflect the changing conditions of telecom networks and information service demands in evolving information societies.

7.0 Conclusion

It is clear that any regulatory method for judging the reasonableness of prices will tend to bias management decisions in one direction or another. The real issue is the implications and consequences of the bias, or special incentives which are created. It is also apparent that all standards for judging the reasonableness of prices require the application of informed judgement to imperfect concepts and methods of measurement. Although continuing research can improve the theoretical underpinning of standards and methods of measurement, their successful application will always depend significantly on the informed judgement and negotiating ability of experienced regulators.

The different standards for judging the reasonableness of prices discussed in this chapter – equity, efficiency (rate of return) and improved performance (RPI-X) – are not substitutes for one another. They provide standards for judgement from different perspectives. Ideally, reasonable rates should satisfy all standards. However, they sometimes conflict. The priorities placed upon application of the different standards depend very much on the particular circumstances in which they are being applied, and these priorities can be expected to change when the circumstances change.

In spite of major theoretical and measurement weaknesses, the RPI-X price cap formula has facilitated dramatic improvements in the telecom system in the UK and to a more limited extent in other countries. It would, however, be a mistake to attribute these improvements directly to the RPI-X method for judging the reasonableness of rates. The major restructuring of national PTOs through corporatisation and/or privatisation has brought about the essential change in focus to efficiency and customer service. Informed regulators have negotiated a share of the benefits for consumers. The RPI-X standard has facilitated the transformation of PTOs from inefficient government administrations to more efficient business operations.

The challenge for the future will be to build on experience and fashion the most appropriate standards for judging the reasonableness of telecom prices after the PTO transformation, in highly imperfect, partially competitive markets. Neither the rate of return nor the RPI-X methods have been demonstrated to be effective in preventing cross-subsidy, i.e., in providing a consistent basis for simultaneous judgements about reasonable maximum prices for monopoly services and reasonable minimum prices for competitive services. Neither method will be very helpful in resolving the future debate about whether information services should be priced primarily as access charges or usage charges. Moreover, some evidence points to the possibility that many dominant PTOs may not rank the potential to earn extra profit nearly as high as preserving their market share and establishing outposts of competition to restrict entry by new competitors. In the new environment regulators will have to take more intensive and detailed examinations of PTO cost structures as a foundation for their rate structures. Costing issues are examined in chapters 17, 18 and 19.

