Technological Change and Competition in the Canadian Telecommunications Industry

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A Study Prepared For The
Public Interest Advocacy Centre
With The Support Of
Consumer And Corporate Affairs Canada

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INTRODUCTION

The telecommunications industry is an industry in transition. The physical infrastructure, the marketplace and the regulatory environment are all being transformed in ways that are destroying the historical barriers to competition. The result is a dynamic and uncertain future for all players in the telecommunications marketplace as they move from a monopolistic to a competitive world. For consumers, this transition promises significant benefits both in terms of the cost of telecom services and in terms of the array of services that will be available to them in the future. Appropriate regulatory policies can help maximize the benefits to consumers in the new age of telecommunications and ensure that an equitable share of the benefits flows through to each class of consumer.

A critical regulatory issue during the next few years will be the impact of technological progress and competition on costs, rates and the regulatory process. Most important, because technological progress in the telecom industry is revolutionizing the competitive environment, the regulatory system must adapt to meet the challenges of the future. The role of regulation in today's competitive telecom environment is drastically different from its role in setting monopoly rates in the past. Regulation must now facilitate the transition to a competitive market in which rates for most telecom services will be set by market forces.

The paper is divided into five additional sections. The first provides an overview of the past, present and future impacts of technology on the competitive environment in the telecommunications industry. Section 2 complements this overview with a discussion of the impact of regulation on the competitive environment. Section 3 examines strategies that can be employed by firms which supply both monopolistic and competitive services to give themselves a competitive advantage over firms that offer only the competitive services. The impacts of modernization and competition on efficiency, rates and regulatory effectiveness are examined in section 4. The final section summarizes the conclusions that emerge from the analysis.

1 THE IMPACT OF TECHNOLOGY ON THE COMPETITIVE ENVIRONMENT

The telecommunications industry is being transformed from a collection of monopolies providing distinct services (telephone, cable TV, telex, etc.) to an industry that is increasingly integrated and competitive. This transformation is being driven by technological changes that have removed many structural barriers that have protected each sector of the industry from inter-sectoral competition in the past. This section provides an overview of the traditional monopolistic structure of the telecom industry and briefly describes how technological change has made competition in the provision of many telecommunication services possible. It also considers the likely impact of future innovations on competitive opportunities in the telecom markets that have not yet become competitive.

1.1 The Past: A Collection of Sectoral Monopolies

Both the current regulatory mechanism and the existing telecommunications infrastructure evolved in an era when there was essentially no competition in the industry. The telephone companies offered Plain Old Telephone Service (POTS) on a monopoly basis. Cable television companies offered cable TV service using technologically distinct facilities (coaxial cable, as opposed to copper wire). Railways offered unique telegraph services. A few specialized data services (e.g., private networks) that were compatible with the facilities operated by more than one sector of the telecom industry were supplied on a competitive basis, but historically these accounted for a very small share of the total telecommunications market.

It is worth noting that because the national railways were built before the development of the national telephone system it was necessary for the railway companies (CN and CP) to provide their own telecommunications services. The railways had to build telegraph links along with their rail lines to run the railway. If the national telephone system had predated the railways, it may not have been economic for the railways to build their own

telegraph systems. They probably would have used the telephone network instead of developing their own private network.[1]

Although the national railways, with their telegraph lines, predated the national telephone system, the railways could not provide telephone service because they did not have local distribution networks. As the telephone system evolved, inter-city toll facilities were installed paralleling the network of the railways. Technologically, the telephone companies were capable of providing the equivalent of telegraph service any time after they established a nationwide network. While they did not offer telegram services, competition between the railways' telex and the telephone companies' TWX services goes back several decades. Because of the limitations of the railways' networks, the scope for competition historically was nevertheless quite limited.

The primary reason for the lack of inter-sectoral competition in the telecom industry was their technological differences. The railways were not connected to a local distribution network, which is essential for most telecom services. While both the telephone and cable TV sectors had local distribution networks, the telephone system evolved as a **narrowband, switched** network, whereas the cable TV network evolved as a **wideband, unswitched** network. These differences reflected the distinct needs of each sector's primary services.

Competition was absent within the telephone and cable sectors because each was a natural monopoly. That is, the distribution networks (i.e., local distribution to customers) can be provided most economically if there is only one firm supplying any particular geographic area. Because telephone and cable companies used facilities that were technologically different, it was efficient to have two monopoly distribution companies with

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[1] Although CN and CP originally competed in the telecom, as well as the rail, business they eventually teamed up in providing telecom services through CNCP Telecommunications, now Unitel. This union allowed the companies to use their parallel facilities more efficiently. It also created a more extensive network than either company could realize on its own.

parallel distribution systems (one using copper pairs; the other using coaxial cable) providing service within the same geographic area. However, it was not economic to have two or more telephone or cable TV networks serving a single geographic area.

The telephone network has always consisted of **switched** facilities because switching is required to provide individual connections between any two customers on request. The telephone companies also provide private line services that do not require the network's switching capabilities. Although these services bypass the switching equipment, the transmission facilities used for private lines nevertheless are part of an integrated switching system that offers flexible use of all transmission facilities. This characteristic of the telephone network has not been changed by technological progress.

The traditional telephone network was **narrowband** because it was designed to carry individual low-fidelity signals from customer to customer, rather than many simultaneous hi-fidelity signals throughout the network. While the bulk of telephone traffic is still narrowband, most interoffice links now use technologies that provide wideband capabilities. Many separate switched signals (e.g., telephone calls) are carried simultaneously on these interoffice transmission facilities. With modernization of switching and transmission equipment, the telephone network is evolving into a network consisting of high capacity digital facilities carrying wideband as well as narrowband signals. Now it is only the local distribution facilities (particularly the customer drop) that are limited to narrowband capabilities. Presently, the telephone companies do not offer wideband service in competition with cable companies; however, these services could be introduced in the future. Recent technological developments have overcome the limitations of the copper-wire-pair customer drop segment of the network.

The unique characteristic of the telephone network is that it must be capable of routing calls (switching). But it can use either narrowband or wideband transmission facilities to carry the signals. In general, it is less expensive to bundle many narrowband signals on each signal path, whether it is copper wire, microwave, satellite radio or optical fibre, than

it is to provide a separate wire-pair or strand for each circuit (i.e., telephone call).[2] That is why, for many years, most of the network, other than the customer drop which generally carries only one customer call at a time, has been designed to carry multiple signals. The proportion of the telephone network that is fibre optic, which can carry the greatest volume of traffic economically, has been increasing rapidly in recent years. As the price of optical fibre and related equipment has dropped relative to copper, the economics of using fibre has become ever more attractive in all parts of the telephone network.

In contrast to the telephone network, cable networks must be **wideband** systems because a wide frequency spectrum is required to carry the many hi-fidelity signals transmitted on cable systems simultaneously. Cable networks are unswitched because customers do not require private links. They simply tap into the common package of signals (including encoded signals for pay channels) being distributed by each cable company over its entire cable network.

Like telephone companies, cable TV companies have shifted to optical fibre as the preferred technology in all segments of their networks except the customer drop. The customer drop is omitted because few customer can receive a digitally encoded light signal, which is the signal transmitted on optical fibre. Of course, where customer requirements warrant it (for example a business customer requiring a high-capacity digital private line), installing fibre optic facilities to a customer's premises can be done easily in order to complete an optical link if that is needed and economic.

With the move to fibre optic facilities in both the telephone and cable TV industries, the last decade has seen the emergence of two fibre-optic networks in major cities that can be used interchangeably to provide many private line and data services. This trend has

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[2] The economic decision regarding the optimal number of signals to carry on a circuit depends on the trade-off between the cost of equipment for compressing and decompressing signals and the cost of more circuits (i.e., more wire pairs or optical fibre strands).

been characterized as the convergence of the telephone and cable sectors of the telecom industry.

Full convergence will require the development of a universal **switched broadband** system, which would be capable of providing the full range of traditional telecom services (telephone, cable TV, telex, etc.). Such a system would combine the essential characteristics of the telephone (switched) and cable TV (broadband) systems. It could also handle all of the services traditionally offered by the rail companies. In addition, a broadband switched network would facilitate the introduction of an array of new telecommunications services that require switching of broadband signals (e.g., interactive TV which integrates cable TV and telephone technologies).

1.2 The Present: The Emergence of Inter-Sectoral Competition

Developments in the past decade have made competition technologically feasible for most telecommunications services. As a result, there has been a running battle between the old monopolies and potential competitors to lower the regulatory barriers to entry. Much of the demand for the removal of regulatory barriers has come from the old monopolists who wish to expand into the other sectors of the industry. Not surprisingly, the existing monopolists generally want to maintain the restrictions on entry into their own turf while gaining access to the turf of others.

This running battle has led to several regulatory decisions that have broken down the barriers separating the monopolistic sectors and increased inter-sectoral competition. An even more competitive future is almost inevitable because only competition provides the flexibility and diversity needed to exploit the supply side opportunities while meeting the emerging demand side needs of business and residential consumers, both of whom are demanding increasingly sophisticated telecom services.

1.2.1 Technology and the Demand for Telecommunications Services

On the demand side of the telecom marketplace, the rapid increase in the power of computers and their shrinking cost have spawned rapid growth in the use of computer-based information technologies and other services that require telecommunication services that can handle high-speed data transmissions. A mere decade ago, almost all computers were owned by large corporations. Those small businesses that used computers at all, used them for limited applications such as internal accounting and word processing. Networking of computers and temporary computer links (via modem) were capabilities that were useful only to a few sophisticated users.

Today, few businesses are not computerized and the role of computers in both business and personal applications is expanding rapidly. Many of these computerized functions involve telecommunications. For example, businesses with many locations typically operate computer networks that link those locations. Existing networks generally rely on private line facilities. However, companies will be able to reduce costs and expand the reach of their high speed data networks by using the public network, once it is fully digital (the required technological standard is known as broadband ISDN). Another example is that most retailers now communicate with the computers of financial institutions to verify credit cards. In addition, many banking functions can now be handled via computer links and the introduction of widespread personal banking by phone will evolve into personal banking by computer as computers become more prevalent in the home. Mail and courier services are being replaced by fax machines, which will be able to operate at significantly higher speed and produce higher quality facsimiles than today's standard once the network is fully modernized. These are only a few of the computer applications that are contributing to the increased demand for data communications.

In addition to the rapid increase in the volume of electronic information (i.e., data as opposed to voice transmissions) being communicated by telecom customers, other trends such as free trade, the growth of worldwide financial markets and the internationalization

of business are increasing the demand for telecom services, especially by business customers.[3]

As the role of telecommunications expands, telecom use is growing rapidly, making business more concerned about controlling their telecom costs. As a result, business users are constantly looking for ways to reduce their telecom costs, without compromising quality or functionality. Competition and bypass can be attractive alternatives to monopoly telecom service, principally because they often offer comparable quality at significant cost savings. Even before competition was introduced in the long distance voice market, the threat of competition, combined with the reality of bypass, forced the members of Stentor to modernize their network, improve the quality of service and reduce long distance rates significantly.[4]

1.2.2 Technology and the Supply of Telecommunications Services

On the supply side, high speed data networks traditionally have been private networks, but the transformation of the national telecom network into a near-universally accessible high speed digital network is only a few years away.[5] Once the telephone system is fully digital, all telephone users will have access to the full range of "high-tech" telecom services, such as high speed fax, computer communications, the full range of call management services, etc. Anyone with appropriate terminating equipment will have direct access to a universal high speed data network. The high-speed private networks

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[3] Some commentators may argue that while internationalization stimulates demand for telecom services, it is the past decade's improvements in the international telecom system that have made the internationalization trend possible, if not inevitable.

[4] The Stentor members referred to throughout the paper are Bell Canada and the eight provincial telephone companies.

[5] Bell's programs to modernize switching equipment, transmission equipment and urban outside plant will be virtually complete by year-end 1996, according to Bell's January 1992 View submitted to the CRTC for the 1992 Annual Construction Program Review.

then will be replaceable by the public network, except where customers such as large businesses and sharing groups are concerned about maintaining a private network for security reasons or where volume is sufficient to justify a dedicated private network on economic grounds.

Network data services have been offered competitively for many years. Fairly extensive networks of users were connected to commercial data network operations. However, many users accessed the commercial networks by means of the analog telephone network. As a result, only large users, with private line connections to these networks or their own private networks, have had access to high-speed digital networks. The capabilities of the circuits accessible to small users have been limited because part of each customer's connection has been analog. Analog circuits are noisier than digital connections and they are incompatible with the standards for high-speed transmission. Consequently, for most customers, data transmission speeds have been severely constrained. In addition, even large users do not have digital access to most potential customers and others whom they may wish to reach on an occasional basis but are not hard wired to their network.

Large volume users such as banks can lease private line networks that meet high-speed data requirements for internal purposes. These services are competitive because they are available from either the telephone companies or rail/cable TV partnerships using the local distribution networks of the cable TV companies and the inter-city links of the rail telecoms, supplemented, when necessary, by facilities leased from the telephone companies.

As already noted, the technological changes that have made competition possible have also lead to convergence of the telephone and cable access networks. Whether an efficient unified distribution network will evolve, and if so, which sector of the telecom industry will control the integrated facilities is the issue that underlies much of the

regulatory effort and strategic investment being undertaken by all sectors of the telecom industry in recent years.

1.2.3 Potential Versus Permitted Competition

Convergence is a reality for the transmission of unswitched data traffic. All sectors of the industry have the technology and facilities to offer data networks and private lines. They also can handle long distance transmissions, whether voice or data, although the networks must be interconnected, and local telephone switches modified, to permit universal access to competitive services without special equipment on customer premises.[6] Because of the CRTC's decision to allow long distance voice competition in Telecom Decision CRTC 92-12, this technological capability has now become a market reality.

The telephone companies are well on their way to developing a fully digital switched network that can offer digital services, including broadband services.[7] As discussed above, most of the switching equipment and interoffice transmission facilities of the Stentor member companies are, or soon will be, digital. The principal non-digital portion of the network is the access facilities that connect the customer to the local central office.[8] But until digital facilities are installed to most customer premises, the telephone network will be limited to providing narrowband analog services on a universal basis. Of course, within most of the lucrative high density business areas, it is already technological

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[6] The modifications that will have to be made to the telephone network in order to facilitate interconnection are discussed in Telecom Decision CRTC 92-12 and in more detail in the submissions to the CRTC by the parties to the hearing into Competition in the Provision of Public Long Distance Voice Telephone Service.

[7] While digital facilities are not broadband in the literal sense of carrying broad frequency spectrum analog signals, they are equivalent to broadband because individual fibre optic strands are capable of carrying many digitally encoded broadband signals simultaneously.

[8] In the access network, the feeder portion is commonly all or partially fibre, while the distribution portion and customer drops are rarely fibre.

feasibility to offer digital services since fibre optic coverage is near universal in these areas.

A new reality has emerged from the technological revolution in the telecom industry. While two local distribution networks (telephone and cable TV) operating as monopolies will continue to be required for the foreseeable future, competition is feasible in the provision of most services provided on these networks.

If the telecom facilities and the services provided on those facilities are viewed as distinct products in the marketplace, then a telecom industry can be conceived in which all services are competitive, although the competitive services would use, in part, monopolistic local access facilities.[9] While providing the facilities for a local access network (telephone or cable TV) is still naturally monopolistic, providing services on those facilities is not. Ultimately, all telecommunication services could be provided competitively, if (i) the telephone and cable TV networks were modified to permit interconnection and integration of the competitive networks and (ii) the provision of services is separated from the provision of facilities. Once interconnection has been completed, the capabilities of Stentor's competitors will have expanded to the point that they could be full-service telecommunications companies.[10]

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[9] A scenario in which the companies offering telephone services are separated from those providing local access telecom facilities is set out in Todd et al (1990). This market structure would facilitate competition in the provision of all telecom services and a significant reduction in the scope of regulation required in the telecom industry. The concept of separating facilities from services has been explored in the context of the Canadian railway system. Variants of this approach have also been implemented for rail transportation in several European countries. Also, natural gas distribution is moving in this direction in Canada and road transport has always operated on the basis of separation of facilities and services.

[10] There is no reason that a competitor such as Unitel could not be the sole contact for a business customer. Unitel could bill the customer for all its telecommunications services, including the basic charge, and remit the appropriate amount to the local telephone companies on its behalf. With unbundling of services, Unitel and others could even provide basic installation and other services normally handled by the telephone companies at the present time.

Without regulatory change, however, local telecom services will continue to be offered on a monopoly basis. Even without regulatory change, the importance of competitive services in the telecommunications industry will continue to increase. The major growth areas for telecommunications are data and long distance services, both of which are now competitive.[11]

1.3 The Future: Convergence and Intra-Sectoral Competition

All sectors of the telecom industry recognize that data communications and long distance services (especially business services) are the growth markets of the future. The penetration rates of both telephone and cable TV companies are already so high that there is little room for growth through increased penetration. In addition, increases in the demand for service (the number of telephone NAS and cable TV subscribers) due to population growth will not be an important factor. Therefore, future growth will be achieved primarily through more intensive use of telecom services.

While there is no reason to expect the market for conventional voice communications (Plain Old Telephone Service, or POTS) to increase significantly, modernization will continue to stimulate rapidly increasing demand for the many Pretty Amazing New Services (or PANS) being introduced by the telecom industry. In recent years, the popularization of facsimile use, for example, has increased demand for telecom services significantly. In the future, the popularization of other new services, such as video teleconferencing, to name but one possibility, will likely be the primary cause of growth in demand.

To achieve the full potential of modernization, however, the telephone companies will have to upgrade the access network to digital standards, either by replacing copper access facilities (including the customer drop) with optical fibre and existing terminating

[11] Since the CRTC's Decision on long distance voice competition (CRTC 92-12).

equipment with digital equipment[12] or by investing in the new equipment that upgrades the capabilities of existing copper facilities. It appears that for most customers this last stage of modernization will not be economically justifiable for many years. Until then, the telephone companies will not be able to offer digital, or broadband services (i.e., cable TV) to residential customers. Of course, cable TV companies and other competitors will not be able to offer switched local telephone service. Nevertheless, competition in the provision of data and long distance services should continue to grow in the coming years. Expansion into long distance voice service should further stimulate competition within the market for data services, due to economies of scope.

Despite the expanded scope of competition, the future position of the telephone companies in the telecom marketplace remains fairly secure because they are the only providers of local switched services. Local access service will continue to be a naturally monopolistic activity until the cellular network, or the evolving digital broadcast technology, achieves the capacity and low price needed to make it a viable alternative to the existing physical (copper and/or fibre optic) access network in providing basic service.[13] If a competitive local broadcast telecom service were price competitive with conventional local service, basic access service would no longer be naturally monopolistic and regulation of local rates would no longer be needed. That stage in the evolution of telecom technology is probably at least a decade away, however.

Given these developments in the telecom industry, the strategic challenge being faced by the telephone companies is how to deal with the narrowing base of monopolistic activities. Whereas historically only the telephone network combined local distribution

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[12] Fibre optic facilities carry digital light signals which are incompatible with existing analog telephone terminating equipment. In addition, customer equipment connected to optical fibre cannot be powered by the telephone line as is the case with existing equipment.

[13] The cellular industry, which is competitive, currently provides an alternative form of access to the telephone network. However, it is not yet an economic alternative to conventional access services for non-mobile uses. It is unlikely to become competitive as long as conventional access is subsidized by toll revenue while cellular access is not subsidized.

facilities with national and international transmission facilities, integration of the telecom facilities of the railways with the local facilities of cable companies has given these competitors a very extensive telecom network in the markets where they have a presence. Regulatory decisions giving these and other competitors access to leased telephone facilities for resale purposes have further enhanced the scope of competition. These regulatory developments, combined with Telecom Decision CRTC 92-12 which requires interconnection, have put Canada on the threshold of a new era of telecom competition. Unitel and other telecom companies competing with the telephone sector will eventually be able to compete on a level playing field, in terms of ease of access, with the Stentor companies. Integration inevitably will increase the scope of services for which they can compete and the attractiveness of the services they offer.

Once the CRTC's decision to allow competition in the long distance voice market has been fully implemented, the new entrants to the telephone business will almost certainly seek ways to expand the scope of their services by getting into the business of providing local service as well. Once the networks are integrated, there is no technological or economic reason that even local service could not be provided competitively using either existing cable facilities or leased local lines. With entry into the business of providing basic local service, they could also provide two-way, interactive services and other value added services that would use the local access facilities. Of course, the evolution of this next stage of competition will require further regulatory change to require leasing of local access lines (or just the customer drop) by the telephone companies to competitors and possibly the interconnection of the local distribution facilities of competitors, such as cable TV companies, to the telephone network on the same basis as the cellular systems are currently connected.

With interconnection the facilities of cable TV companies could be used to provide access services through their own local switches that would interconnect with the local telephone companies' local switches or through common switches. In areas where cable and telephone facilities are both being installed for the first time (for example, new residential

developments), it may be more efficient to install an integrated fibre-optic distribution system, than to install parallel cable and telephone distribution systems. However, the development of integrated facilities would require a level of cooperation that is unlikely to occur without significant regulatory pressure and/or industry restructuring. It would also require a new generation of low-cost terminating equipment that connects to optical fibre transmission facilities.

Faced by the rapidly expanding scope of competition, the telephone companies inevitably will attempt to use their monopoly control of local access facilities to give themselves an advantage over their interconnected competitors. Strategies of this type are examined in section 3, below. They can also be expected to seek to shift calling from the competitive long distance category to the monopoly local category by extending local calling areas.

2 The Impact of Regulation on the Competitive Environment

Although the range of telecom services for which competition is technologically feasible has grown rapidly in recent years, regulatory restrictions on entry have limited the scope of competition in the market. Data services have been competitive for many years, but voice services have not been, except for cellular services, until the CRTC authorized competition in the long distance voice market in June 1992.[14] Competition is still not permitted in the provision of local telephone and cable services.

As noted earlier, however, it is now technologically and economically feasible to allow competition in the provision of all services. The only clear evidence of natural monopoly is in the provision of local distribution facilities.

The distinction between services and facilities can be seen by considering the analogy of transportation to telecommunications. Transportation facilities such as roads and railways are analogous to fibre, copper and radio telecom facilities. Like land transport facilities, telecom facilities could serve as the infrastructure for competitive service providers. Just as a road can provide the facilities required by many trucking companies to offer competitive services, so too could many competitive telecom service providers offer a variety of local and long distance services by interconnecting their facilities with a single monopoly local distribution network. The interconnected companies could lease local facilities from the monopoly local distribution company to provide a full range of services including basic local access services. With competitive service providers of local service, a number of local service options would most likely emerge, offering a number of local service options with different free calling areas, different rate structures and so on.

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[14] Implementation of CRTC Decision 92-12 which permits competition in the market for long distance telephone service was delayed by an appeal to the Federal Court of Appeals by the telephone companies. The Court declined to hear the appeal.

2.1 The Evolving Role of Regulation

Historically, the principal reason for regulating the telecom industry, was that each sector was a natural monopoly. The most efficient market structure (i.e., lowest cost to the consumer) in a naturally monopolistic industry is a single firm. However, a profit-maximizing monopolist will charge an excessive price for its services. The monopoly price violates the economic principle of efficiency. As a result, the prices charged by monopolists are regulated to ensure that consumers do not overpay for service, prices are efficient, and the monopolist does not earn excess profits.

While regulators normally pursue these goals by means of a regulatory procedure such as rate base rate-of-return regulation that ensures that total allowed revenues are roughly equal to the regulated firm's costs, revenues from specific services often deviate significantly from the costs of those services. These deviations compromise efficiency but they are considered an acceptable way to pursue other public policy objectives. For example, in the telephone industry, access costs, which are common to both local and toll services, are recovered in part through the rates charged for toll services although they are fixed costs that would be more efficiently recovered as a fixed monthly charge (i.e., the basic monthly rate).[15] The amount by which toll revenues exceed direct toll costs is termed the contribution that toll makes toward the costs of basic (i.e., local and access) service costs. This form of cost recovery is often viewed as a cross-subsidy of basic service by long distance service. The regulatory rationale for this policy is that it makes basic service more affordable and accessible. Similarly, high volume routes subsidize low volume routes, urban customers subsidize rural customers and so on to make rates more equitable by basing them on the value of the service provided rather than on cost.

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[15] The efficiency principle also prescribes that the cost of local calling, which is traffic sensitive like long distance calling, should be recovered through a usage-based charge.

This approach to setting regulated rates leads to the undesirable result that if unregulated competition were permitted, competitors could enter the industry and underprice the monopolist in selected services (i.e., the ones with high contribution rates) and operate profitably even if their costs were higher than the monopolist's costs. In other words, when regulated prices involve cross-subsidies, there is a risk of uneconomic entry if unregulated competition is permitted. To avoid uneconomic entry, regulators must regulate entry as well as price and establish conditions of entry, such as the payment of contribution. Furthermore, because interconnection is required for competitive entry, interconnection terms and conditions must be regulated to ensure that the companies that control bottleneck facilities do not exploit them in an anti-competitive way.

Unfortunately for regulators, real world markets can be very complex. It can be difficult to determine whether competitive entry would be economic in certain circumstances. It is particularly difficult to determine the economics of inter-sectoral competition in the telecom industry. The CRTC hearing into long distance voice competition addressed the question whether competitive entry would increase or decrease the total cost of providing telephone service. A definitive answer was quite elusive. Furthermore, from a societal, as opposed to an industry perspective, the relevant issue is not just whether competitive entry through inter-sectoral competition would decrease the total costs of supplying monopoly telephone services, but whether it would increase the total cost of telecommunications services. Even if competitive entry increased unit costs for telephone services,[16] it is possible that the unit cost of other telecom services could decrease enough to improve economic efficiency overall.

While the policy of restricting entry into the monopolistic telecom markets was not controversial when it reflected the technological reality that each type of service was a

[16] The CRTC took the position in CRTC 92-12 that competitive entry in long distance voice services would not increase unit costs. However, this position appeared to rely on efficiency gains that would result from competitive pressure on the monopoly telephone companies rather than technical efficiency that might result from the impact competition would have on the scale of telecom firms.

natural monopoly, technological change has made that policy obsolete. Furthermore, with the maturing of the cable TV industry, ties between the rail telecoms and the cable TV companies were a natural development. The rail telecoms had inter-city links, but no distribution network. The cable TV companies had local distribution networks and limited inter-city links. By cooperating, the rail/cable telecoms can create a network capable of linking any two locations within the regions they serve. The result is an unswitched broadband network that parallels the switched narrowband network of the Stentor member companies. The existence of these parallel networks facilitates competition in the provision of unswitched, narrowband (e.g., private line) services. The regulatory changes that have occurred in recent years were the inevitable consequence of this development.

The disappearance of the technological barriers separating the sectors of the telecom industry drastically changed the role of regulators in the telecom industry. Regulators found themselves having to regulate competition as well as regulating rates. As the feasibility of inter-sectoral competition increased, regulators had to decide how much competition would be permitted. Their world had moved from one in which nearly all potential competition was clearly uneconomic to one in which the traditional restrictions on competitive became increasingly difficult to defend. The response of Canadian regulators was to create two categories of services for regulatory purposes: those for which competition was permitted and those for which competition was not permitted. Until recently the distinction was simply: voice services were monopolistic and data services were competitive.

With the recent CRTC decision, long distance has been moved from the monopoly to the competitive category in most regions of Canada. Access and local services remain monopolistic, at least for the time being. The implications of this change for the regulatory process are quite significant. Although the current regulatory regime was established at a time when most of the revenues of telecom companies were derived from monopolistic services, most revenue is now derived from competitive services. The telephone companies are no longer monopolies with some competitive services and

revenues. As a result of regulatory change, they have become competitive firms that provide a few monopoly services. Their primary source of revenue, and principal area for future growth, is the competitive side of their business. Monopoly services have become a secondary activity that can be exploited to enhance the competitiveness of the firm.

2.2 Structural Lag Due to Regulation

One implication of regulation is that it slows the rate at which the structure of markets adjusts to changing economic and technological forces. Given the difficulty regulators have in determining whether competition would be economic and viable, there appears to be a tendency among regulators to restrict entry even when competition becomes technologically feasible and potential competitors are seeking to enter the market. As a result, there is a significant lag between the technological developments that make competition economic and the regulatory decisions that make competition a reality. The structure of the regulated marketplace lags behind the underlying market forces.

Technologically, long distance voice competition could have been permitted many years ago. If it had, the digital switching equipment that has been installed by the telephone companies over the past decade could have been designed to accommodate interconnection and much of the cost of retrofitting the switches could have been avoided.

Similarly, it is already technologically feasible to introduce competition in the provision of local services. If competition were permitted, it would affect the form of new investment in local plant in coming years. Unfortunately, it appears that regulatory lag in recognizing the inevitability of competition in the provision of local service will result in continued investment in plant that is designed for a monopolistic marketplace.

2.3 Strategic Uses of Regulation

It benefits monopolists to have regulators restrict competitive entry. However beneficial competition may be for the consumer, a monopolistic firm is bound to be inconvenienced, if not financially hurt, by competition. It will lose market share. It will have to respond to competitors by reducing prices. Even if it can cut costs, or raise monopoly rates, sufficiently to maintain profitability despite competitive entry, the monopolist has to change it approach to doing business. That is inconvenient. It should not be surprising that a monopolist would expend a great deal of effort and money attempting to retain its monopoly. While it can attempt to do this by improving productivity and reducing rates,[17] it can also seek to limit competition by pursuing protectionist regulatory policies.

The initial battles in the competitive war between the telephone companies and alternative long distance voice service providers (Unitel, BCRL, resellers and future entrants), have involved the pursuit of a competitive advantage through regulatory decisions. The terms of entry for the new competitors have largely determined both the profitability of new entry and ultimately the share of the market that the new entrants will attract. The level of the contribution payment made by the new entrants to the telephone companies, the share of the costs of modifying existing switching equipment to allow interconnection and the ability of the telephone companies to rebalance local and toll rates all will have a significant impact on whether the playing field is level or whether it is tilted to the benefit of either the Stentor member companies or the new entrants.

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[17] See the literature on contestable markets, notably Baumol (1982). Also, competitors can be defeated by subsidizing competitive services with excess revenues from monopoly services.

2.4 Can Regulation Resist Market Forces?

The ability of regulators to resist market forces appears to be limited. It is very difficult for a regulator to prohibit competition effectively when the market rewards users for bypassing the regulated companies. All regulation can do is increase the cost of competitive alternatives. Where potential competitors have a large enough incentive to find a way around regulatory restrictions, they can be very creative in finding ways to do so. Competitors and customers have been finding ways to circumvent the restrictions on long distance voice service in Canada for many years.

Large customers have used private lines to avoid the switched long distance network on some portion of their calling for many years. As technology made shared and "virtual" private lines increasingly economic, the size of firm that could benefit from private lines declined steadily. Also, bypass via the United States became increasingly attractive as long distance rates in the U.S. declined. Additionally, as it became increasingly common for voice signals to be digitized, the ability of the telephone companies and regulators to distinguish between data transmissions (which were competitive) and voice transmissions (which were not) was becoming increasingly difficult. For these reasons, the regulatory restrictions on competition were becoming irrelevant for an increasing segment of the market before the CRTC's decision to permit long distance voice competition.

As the number of methods of economically circumventing the restrictions on long distance voice competition has increased, the sustainability of the old monopolistic regime declined. The telephone companies were losing business even without competition being formally recognized. Businesses taking advantage of bypass became aware of the possibility of benefiting from even greater savings if competition were permitted. Customers who were too small to take advantage of bypass opportunities, resented being denied the opportunity of saving money just because the monopoly of the telephone companies was being protected. Not only does the sustainability of restrictions on competition decline in the market when competition becomes economic because market

realities undermine the restrictions, but the restrictions become politically unsustainable as well.

3 COMPETITIVE STRATEGIES IN A REGULATED PARTIAL MONOPOLY

Canadian telephone and cable TV companies are partial monopolies. Each offers not only a few monopolistic core services (i.e., basic telephone and cable services) but also an array of competitive telecommunications services (e.g., private line and data services). Their monopoly and competitive services use common facilities. A partial monopolist has several competitive strategies available to it that are not available to firms that provide only competitive services. This section describes several of these strategies.

3.1 Cross-Subsidization of Competitive Services

Economic theory shows that economic efficiency is generally improved if the price charged for a monopoly service is less than the profit-maximizing monopoly price. As a result, regulated rates for monopoly services are usually less than the rates an unregulated monopolist would charge. The veracity of this theoretical observation is borne out by the fact that regulated firms almost invariably charge the maximum permitted rates. Furthermore, the rates for monopoly services that regulated firms request are frequently reduced by their regulators. It follows that strategies that increase rates for monopoly services are attractive to regulated telephone and cable TV companies.

Most Canadian telephone companies (i.e., those within CRTC jurisdiction) are subject to rate base rate-of-return regulation. The return on investment that each company can earn on regulated services is restricted to a range that the CRTC determines to be the company's cost of capital. Management is not able to maximize profit, as would management of an unregulated competitive firm. If the firm earns a return above the permitted range, rates are reduced (and customer rebates might be required[18]) so that the return would be within the permitted range.

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[18] For a precedent, see Telecom Decision CRTC 86-17. This decision was contested in the courts, but was ultimately upheld.

When the rate of return is constrained, management tends to seek to maximize the scale of the operation rather than profit. It can be expected to adopt strategies that increase the firm's market share of competitive services. One effective way to increase market share is to reduce the prices of competitive services while maintaining profitability by increasing monopoly rates.

Given these observations, it is evident that as long as the telephone companies are regulated by means of rate base rate-of-return regulation they will have an incentive to decrease rates for competitive services by allocating a larger share of their costs to monopoly services. Management also has an incentive to maintain the return on investment at the maximum level permitted by the regulator.

This strategy could undermine the viability of the competitive telecom market. Of greatest concern is the risk that the partial monopolists may match, or undercut, the price of all competitors even if the monopolists costs are higher. Only the partial monopolist can make up any deficiency in competitive earnings through increases in monopoly rates, subject to regulatory review. Clearly, to eliminate competition in this manner will benefit the partial monopolists by enabling them to increase their market shares and possibly to remonopolize the industry.

An effective strategy for increasing monopoly rates and decreasing competitive rates is rebalancing rates for local/access service and long distance service. Rate rebalancing has been a major issue in recent years because all Stentor member companies have been decreasing rates for inter-provincial long distance service while holding basic service rates constant or increasing them. In general, the telecoms have also reduced intra-provincial long distance rates.[19] Even with the long distance rate reductions to date, a

[19] One exception is the Manitoba Telephone System, which has increased intra-provincial rates while decreasing its Stentor-determined inter-provincial and international rates.

significant share of common and access costs are recovered through long distance revenues. Rebalancing would shift more of this burden to the monthly basic charge.

Efforts by the Stentor companies to rebalance rates are motivated by the realization that they can gain a competitive advantage over new entrants into competitive long distance voice service by rebalancing so as to reduce their effective level of contribution to access service to less than the CRTC-mandated contribution rate for competitors. This strategy undermines the principle of Telecom Decision CRTC 92-12 that the "playing field" should be levelled by requiring competitors to pay contributions for long distance services that match the toll-to-local contribution embedded in the rate structure of the telephone companies.[20] The CRTC's principles of affordable access and equitable treatment of ratepayers may be compromised if the contribution rules are ineffective in recovering the intended contribution per minute of long distance usage of competitive services.

It is interesting to note that the telephone companies have given scant attention to other forms of rebalancing which could be introduced to reduce or eliminate other forms of cross-subsidization, such as the urban-to-rural cross-subsidy or the POTS (Plain Old Telephone Service) to PANS (Pretty Amazing New Services, essentially digital services) cross-subsidy.[21] The focus is not surprising when it is considered that the telephone companies have a strong competitive motive only for ensuring that cross-subsidization of monopoly basic service by competitive long distance voice services is eliminated.

Taking the incentives of the telephone companies a step further, it is clear that it is in their interest to reduce the level of contribution embedded in their rates, provided there

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[20] The new entrants enjoy a discount on the contribution until 1997, however. This discount is premised on the assumption that new entrants require a discount during the first few years in order to be competitive due to business start-up costs and unequal access by customers to the long distance networks of Stentor and its competitors. Without this discount, competition may fail before it becomes viable.

[21] See Todd (1990).

is a lag in the reduction in the level of contribution that competitors are required to pay. If the level of contribution will be determined on the basis of historical information, or forecasts that underestimate the reductions in Stentor contributions, regulatory lag can be anticipated. Due to regulatory lag, the telephone companies will be paying a lower contribution than their competitors, if their cost or rate structures change so as to reduce their contribution.

Conversely, since contribution is generated through a per trunk charge, competitors can reduce their contribution per minute of long distance usage by using trunks more intensively than anticipated when contribution charges were established. They can also reduce contribution by connecting customers to their long distance networks using direct access lines (DALs). The risk that the telephone companies and their competitors will not pay the same level of contribution arises because the contribution payments are not determined in the same way. Each class of telecom will have different opportunities to reduce its contribution payments.

Furthermore, because determining the exact level of contribution from toll to local/access is inherently an impossible task, it is inevitable that there will be some error in setting the level of contribution to be paid by interconnected and resale competitors. Clearly, the telephone companies will be seeking to have the contribution level set as high as possible through the hearing process, while their competitors will be attempting to have it set as low as possible. Whichever side is more successful in having its position accepted by the regulator will have a slight tilt to their benefit in the playing field.

Finally, it is not even clear that if the regulator could determine the telephone companies' contribution rate precisely, requiring their competitors to pay the same contribution rate would result in a level playing field.[22] The mix of services offered by the telephone

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[22] In this sense, a level playing field implies that the costs of service for equally efficient firms would be equivalent. Elsewhere, the concept of a level playing field implies no more than that all firms pay equal amounts of contribution to access cost per minute of long distance usage.

companies differs from the mix offered by their competitors; therefore, economies of scope may differ for different types of telecoms. But it is not the regulator's role to compensate for any differences in the costs of different types of telecom companies. Rather, it is the job of the market to allow those differences to determine competitive winners and losers.

3.2 Shifting Risk to Consumers

A partial monopolist telephone company, like its competitors, must commit to investments that will produce an uncertain return. For example, although revenues from competitive activities are expected to be substantial, making the investment in modernization profitable, actual competitive revenues could turn out to be either far above or far below expectations. If the competitive services are sufficiently lucrative, they will reduce the rates for monopoly services that enable the firm to earn its allowed rate of return. If its competitive activities have disappointing results, however, rates for monopoly services may have to be increased if the company is to earn its allowed rate of return. Clearly, if the regulator always adjusts monopoly rates so that the company earns its allowed return, whatever the return earned on its competitive services, the risk associated with a partial monopolist's competitive activities will be borne by monopoly consumers rather than investors. If competitive services make money, rates for monopoly services will be reduced; hence, profits are passed through to consumers. If they lose money, monopoly rates will be increased, thereby passing competitive losses through to consumers.

The extent to which the risks associated with competitive activities are shifted from investors to consumers by the regulatory process is mitigated slightly by regulatory lag and the use of a range of allowed returns.[23] More aggressive forms of incentive regulation shift more of the risk to investors by allowing investors to retain a larger share

[23] The CRTC normally establishes a one percentage point (100 basis point) range in the permitted return on equity it allows the telephone companies in its jurisdiction.

of any profits and force them to bear a larger share of any losses. Of course, the purpose of incentive regulation is not to increase the portion of risk borne by investors but to increase the incentive, from the perspective of investors, and therefore management, to improve profitability by increasing revenues and reducing costs. But risk is the motivating force behind the incentive.

In normal competitive firms, shareholders bear all of the risk associated with their investments. Low profits in one line of business do not enable the firm to increase prices for its other products. Consequently, to the extent that the owners of a firm are risk averse, and management decisions reflect the will of informed owners, there is an inherent caution regarding investments in activities that will generate an uncertain return. Furthermore, those who bear the ultimate responsibility for undertaking a risky investment, the investors who are represented by the board of directors, also bear the risk. The same is not true of regulated partial monopolies such as the telephone and cable TV companies. In those companies, consumers, who bear a major share of the risk accepted by the company when it invests in competitive activities, are not represented on the boards of directors. Since the risk-bearers do not have a direct voice in management decisions, it should not be surprising if partial monopolists tend are less cautious about the riskiness of their investment than are comparable competitive businesses.

In particular, partial monopolists have less incentive to be cautious about their investment in new technologies that may aid them in the competitive marketplace. When the regulatory system assures them of earning the allowed return, the risk borne by the owners of the firm is not commensurate with the risk inherent in the investment. Yet whether or not the investment is profitable, it will increase both the company's scale of operations, which is an attraction to management, and its rate base, which is an attraction to investors.[24]

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[24] The incentive to inflate the rate base is known as the Averch-Johnson Effect (1962).

3.3 Preemptive Modernization

A further strategy that is beneficial to the partial monopoly telephone companies in modernizing as quickly as possible. Not only is the investment virtually risk free, as noted above, but by modernizing quickly the Stentor companies modernized virtually their entire network before competition in the long distance voice market was introduced.

By modernizing quickly, the Stentor member companies have established high technical standards for the services they offer. In addition, they will be able to offer most non-niche services earlier than their competitors.[25] The first one into any market has a big advantage in terms of acquiring and holding market share. Few customers switch suppliers unless there in a definite advantage to the move. Competitors will have to attract customers away from the Stentor member companies almost exclusively by lower prices. They will not be able to offer services that Stentor companies cannot provide.[26] The Stentor member companies no doubt hope that it will be difficult, if not impossible, for their competitors to maintain an attractive discount, provide a high degree of quality and reliability and remain profitable. In addition, potential competitors will be discouraged from investing in facilities to compete with the Stentor member companies. By investing heavily early, Stentor may be able to preempt new facilities-based competition by increasing the risk facing potential new entrants. Even if entry is not preempted, if the Stentor member companies can maintain a technological lead it can help them maintain their market share and increase future growth. Also, by building excess capacity, a partial monopolist can then argue that it would be uneconomic for new entrants to be permitted to build new facilities.

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[25] Unitel's recent alliance with AT&T, accomplished by AT&T's acquisition of 20% ownership in Unitel, will do much to equalize the technological edge the Stentor member companies established.

[26] If many competitors enter the market, it is likely that some will seek to meet the need of niches that are neglected by large telecom companies, such as the Stentor companies. Large suppliers tend to focus on large markets, not small niches.

A further advantage of accelerated modernization is the fact that once the investment in modernization has been made, the Stentor companies can begin recovering the cost of the new facilities from current customers with revenues from traditional POTS. A significant portion of the capital investment in modernization will have been recovered by the time long distance voice competition has matured and most of the new services that digital technology makes possible have been introduced. Stentor member companies will be able to maintain lower prices in the face of competition than would otherwise be possible because they can recover a significant share of the cost of these facilities from monopoly services.

In addition, under the current method of regulation, a disproportionate share of costs are recovered in the early years of an investment. With today's digital technology, the cost of incremental capacity is quite low once a digital switch or fibre optic cable has been installed. As a digital switch expands, or the volume of traffic on an optical fibre increases, the capital cost and depreciation per line or message declines. Similarly, as services are added, the annual depreciation of the switch is spread across a larger revenue base. As a result, rates must be higher, in real terms, early in the life of the switch in order to fully recover allocated costs based on the equal life method of depreciation used by the telephone companies.

Viewed another way, as time passes, and competition increases, the telephone companies will be able to reduce rates, all other things being equal. In particular, they can justify charging a low price for new competitive service on the grounds that as long as a competitive service covers its incremental costs, it is preferable to have a low rate and maintain market share than it is to increase rates and lose market share.

In addition, accelerated modernization results in accelerated depreciation of the capital cost of old switches. Accelerated depreciation increases the telecom's revenue

requirement during the period in which the modernization programs were under way.[27] This justified higher monopoly rates (i.e., basic service rates) than otherwise would have been necessary. By justifying higher monopoly rates, competitive services need generate less revenue.

As the average cost of the facilities declines with time, the Stentor companies will have to reduce rates to stay within the permitted range for their target rate of return. It can be expected that the Stentor member companies will seek to reduce rates for competitive services and maintain, or even increase, rates for monopoly services. As long as they can avoid a rate hearing, their recovery of costs by rate class will not be subjected to close scrutiny. It would be quite possible for the subsidy of access services to be reduced significantly while the contribution of competitors is adjusted to reflect the reduced contribution of the Stentor companies with a lag. This would give the Stentor companies an important competitive advantage.

Because of the way in which the costs of modernization are allocated through time by the current regulatory procedures, the cost of modernizing the telephone system to make it more competitive with new entrants is borne disproportionately by residential ratepayers because that customer class makes little use of services that require a modernized network. The residential consumer is paying higher rates due to the rapid development of a system that is designed to meet the needs of the sophisticated business user. Few residential customers have the need for digital facilities, yet all the telecom's in Canada have programs to replace existing analog facilities (switching and transmission) with digital facilities as quickly as possible and to raise basic service rates to pay for the additional capital investment. While basic service customers will be rewarded by lower rates in the future if the success of Stentor members in the competitive markets meets projections, the return is uncertain. Also,as noted earlier, it is consumers that bear the risk related to the competitive activities of the telephone companies, not investors.

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[27] See Todd (1990).

The added factor that it is difficult, if not impossible, to determine the "right" price for PANS services increases the benefit of preemptive modernization for the Stentor companies. One of the characteristics of the modernized telephone network is that the marginal cost of most add-on services, such as custom calling features, is close to zero. With digital switching these are often software features.

The revenues generated by add-on services were taken into account in justifying the investment in modernizing Stentor's existing facilities. These revenues can be expected to make a significant contribution to the common costs of the telephone system. But the amount of the revenue contribution will depend on the amount charged for these services. In the competitive environment, it is not certain that these features will contribute to the level anticipated in the economic studies used to justify the investment in modernization. Therefore, there can be no assurance that these revenues will in fact be sufficient to compensate POTS customers fully for the initial incremental costs of modernization that were borne by monopoly service customers.

Once the modernized facilities are in place (i.e., the investment in modernized plant is a sunk cost), the telephone companies can argue that add-on services should be priced to maximize revenue. Since the marginal cost of these services is near zero, maximizing revenue maximizes the contribution of each service to common costs and minimizes the costs borne by monopoly services. There is a risk, however, that in a competitive environment some of the low cost features could be priced very low and packaged with competitive offerings as a method of increasing market share. It can only be hoped that the contribution to common costs made by these services is sufficient to make a contribution to common costs that is large enough to ensure that POTS customers, as well as PANS customers, realize a net benefit from modernization.

3.4 Regulatory Protection

The most effective strategy for a partial monopolist to maintain market share in a competitive market is to convince the regulator to restrict competition. As discussed in section 2, all telecom services, as distinguished from facilities, are potentially competitive. But when competition is not allowed, as it is not for local voice telephone services and cable TV services, and was not for long distance voice services before the implementation of Telecom Decision CRTC 92-12, the telephone or cable TV company can maintain a 100% market share.[28]

For this reason, it is not surprising that both the Stentor member companies and their potential competitors have spent a great deal of money seeking favourable regulatory decision. The cost of this effort is of little concern to the partial monopolists because they can pass the costs through to customers. Regulatory costs are permitted regulated costs of service; therefore, they increase the revenue requirement of the company that incurs them. Money spent on the regulatory process flows through to rates paid by consumers, not the profits earned by investors. "Investing" in the regulatory process is risk free under the current regulatory rules. Furthermore, given that rates for competitive services and market share are determined primarily by market forces, they are not sensitive to expenditures on regulatory proceedings. It is monopoly services that pick up the entire tab for regulatory costs, either through rate increases or lost opportunities for rate decreases.

While firms in competitive industries focus their managerial effort and investment on increasing their efficiency and on developing new products and innovations that can be sold profitably, the partial monopolists and their competitors must invest major amounts in attempting to win favourable regulatory rulings. In many cases, these regulatory rulings

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[28] Bypass may cause some revenue erosion. For example, satellite dishes may serve as an alternative to cable TV and direct access lines to a competitor may reduce the number of Stentor network access lines a telephone customer needs.

can be more important than the relative efficiency or capabilities of competitors in determining who survives and grows and who fails in the regulated marketplace.

4 ASSESSING THE IMPACTS OF MODERNIZATION AND COMPETITION

The technological developments that have led to the modernization (i.e., digitalization) of the telecom network in Canada and evolution of a competitive telecom industry have had many impacts that will be felt by consumers in the future. This section assesses the impacts of these changes in terms of the efficiency of the telecom industry, rates for telecom services, the differences in rate impacts across customer classes, and the effectiveness of regulation.

4.1 Impacts on Efficiency

To gain approval for their capital programs that involved investments in digital switching equipment and fibre optic transmission facilities, the telephone companies had to show that the new technologies are more cost effective than the old technologies. The weight of evidence that has been provided over the years makes it clear that modernization of the telecom system significantly improves efficiency. Costs are declining while the quality and range of services being offered expanding.

The efficiency effects of competition have been more controversial. An important part of the debate over whether long distance voice competition should be permitted, for example, related to the issue of whether competition would increase or decrease total costs in the telecom industry. In the final analysis, the CRTC determined that competition could be expected to improve technical efficiency, which implies that competition would result in lower total costs for the quantity and quality of services that would be delivered in the competitive market.

Competition improves efficiency by providing a discipline that is difficult to simulate with any regulatory regime. A competitive marketplace forces all firms to operate reasonably efficiently. Those that are not efficient cannot raise their rates above their competitors'

rates to recover their excess costs. As a result, inefficiency translates into a low return on investment. Consumers do not suffer, but investors will.

In a regulated monopoly, neither consumers nor regulators have an objective reference point for assessing the efficiency of a firm. In particular, there is no competitor to provide an easy reference point for comparing prices and the company's return on investment. The regulator can identify sources of inefficiency only by scrutinizing the firms budget in detail and assessing the reasonableness of each expenditure. While some inefficiencies can be identified and eliminated, it is inevitable that many unnecessary costs will not be caught. When inefficiencies are not identified, the resulting costs do not result in decreased profit as they do in a competitive industry. Instead they result in higher prices for the firm's products and services because they are included in the company's revenue requirement. Because the regulated firm is a monopoly, consumers cannot switch to another, more efficient, supplier to escape being charged an excessive price to cover the cost of the firm's inefficiency.

Put simply, the regulated firm has an incentive to avoid only those inefficiencies that can be identified by regulators. Any inefficiency that is not caught by the regulator will be welcomed by the firm. Inefficiency generally makes life easier for managers; therefore, it is preferred to efficiency when there is no cost in terms of the firm's profitability. Inefficiency is also attractive because it creates more room for painless belt tightening should that become necessary due to future regulatory decisions.

The expectation of the advocates of telecom competition is that if more of the business of the Stentor member companies is subjected to competition, there will be less opportunity to pass through the costs of inefficiency. There are limits to the extent to which the costs of inefficiency throughout the company can be loaded onto a small base of monopoly services. If a large portion of a firm's business is competitive, it will have to be more efficient in those parts of the business. In addition, for costs allocated to the competitive services, there is a clear reference point for assessing the efficiency of the

regulated company's operations. Moreover, if most of the partial monopolist's business is in competitive markets, it can be hoped that a competitive mind set and corporate culture will come to dominate throughout the firm.

In the language of economics the term efficiency refers to allocational efficiency, the efficient allocation of resources within the economy generally, as well as technical efficiency which is the focus of the preceding comments. Because competition tends to drive prices to a level that reflects economic costs, excluding externalities, competition should enhance allocational efficiency, as well as technical efficiency, in markets for services that do not entail external benefits or costs. There is no evidence of significant external costs or benefits in the production of telecom services that should be reflected in the price; therefore, a competitive price will be allocationally efficient. Of course, as discussed below, there may be social considerations that dictate policies that alter relative prices for telecom services, thereby compromising allocational efficiency. However, workable policies exist for pursuing these policies in either a competitive or a monopolistic market structure.

Section 3 discussed several competitive strategies that regulated partial monopolies can be expected to adopt to protect their market shares and increase profits work against the goal of economic efficiency. Each strategy involves using the firm's monopoly position to gain a competitive advantage, which undermines the normal discipline of the competitive market. Those strategies are similar to the strategies that pure monopolists normally adopt to increase their profitability to the benefit of owners and management. In both cases, regulators are charged with the task of attempting to induce management to operate as efficiently as possible, by identifying and disallowing the inefficient investments and rate proposals that stem from these strategies.

4.2 Impact on Rates

Measuring the impact of technological change and competition on the rates paid by each class of customer is difficult. Certainly, efficiency improvements must benefit customers generally. Furthermore, where customers in aggregate are made better off, it is at least possible to distribute the benefits so that all groups of customers are made better off. However, because it is impossible to know what rates would have been without technological and regulatory innovation, it is impossible to know the extent to which each class of customer has benefitted.

The regulated telecoms nevertheless have the data and resources to provide estimates of the impacts of technological change and competition on rates. For example, as rates adjust in coming years in the competitive environment, the total cost of a typical basket of services purchased by customers in each class could be tracked. A price index for telecom services by customer class could be developed. This would provide a useful indication of the distribution of the benefits of technological change and competition by rate class, or even by type of customer within each rate class.

Because a partial monopolist has a much greater incentive to use the efficiency gains of modernization to reduce rates for competitive services than it has to reduce monopoly rates, it can be expected that competitive service customers will benefit not only from competition, but will gain most of the benefits of modernization. As discussed in section 3.3, in the early years of modernization, when there is a net cost to modernization, the revenue requirements of the telephone companies are increased. Basic rates are driven up by the investment in digital technology. In later years, when there is a net benefit to having modernized, the revenue requirement can be expected to decrease; hence, rates overall should be reduced. To the extent permitted by the regulators, the telephone companies can be expected to use the savings to reduce competitive, rather than monopoly, rates.

4.3 Impact on the Effectiveness of Regulation

Modernization and competition have altered the economics of the telecommunications industry in ways that make price regulation of the mixed monopoly/competitive telecom businesses increasingly difficult. With modernization, many new add-on services, such as call management services, are being introduced. The marginal cost of many of these new services is very low because the basic requirement for offering the services, once a digital switch has been installed, is the cost of the software required for the particular features required for the service. With technological innovation, an increasing proportion of the total revenue of the Stentor member companies is derived from these service offerings that have negligible direct costs. The revenue generated by these services was an important consideration in the economic justification of modernization. In projecting the costs and benefits of modernization, these services were expected to make a significant contribution to the common costs of the digital facilities. Whether they actually do, depends on the rates that are set for these services.

Unfortunately, because a large portion of telecom costs are common and access costs, setting rates based on a cost allocation process is inevitably a judgement laden and somewhat arbitrary process. Furthermore, the principle for setting rates for optional add-on services is that their rates should be set to maximize their contribution to common costs. Adopting this principle permits basic rates to be kept as low as possible. However, since little is known about the demand elasticities of these services, determining the appropriate rate is essentially a judgement call. The judgement of the company is generally accepted by regulators unless there is clear evidence that its judgement is in error. This judgement is unavoidably coloured by strategic considerations such as those discussed in Section 3.

The principle of contribution maximization is also used for setting rates for competitive services. The most important consideration in determining contribution-maximizing rates for competitive services, however, is the price being charged by competitors. There is

therefore a significant strategic component in rate setting. Rates must be sufficient to at least recover direct incremental costs, but these costs are generally minimal. While the contribution that they make to common costs should be maximized, the strategies discussed in Section 3 could lead to pricing such that competitive services make little or no contribution to common and access costs, leaving the full burden to be borne by monopoly services.

This approach to rate setting constrains the control exercised by regulators over the partial monopolist telephone companies. Regulators are well equipped to set rates based on a cost allocation procedure. They are not as well equipped to review rates that have been set by a regulated partial monopoly based on market conditions and judgement. With the shift of telecom revenues from monopoly to competitive categories, the focus of regulatory activity must shift from setting monopoly prices that are reasonably efficient and equitable for consumers to setting prices that do not give either the partial monopolists or their competitors an inappropriate competitive advantage. For example, the CRTC must ensure that the level of contribution borne by the users of the services of Bell's reseller and facilities-based long distance competitors is comparable to the level of contribution that is implicitly paid by the toll customers of Stentor companies.

Perhaps the most serious problem compromising the effectiveness of regulators, however, is the fact that it is impossible to accurately determine the level of contribution inherent in the rates of the Stentor companies. This is a problem because the contribution required of competitors may be higher than the true economic contribution inherent in Bell rates, in which case Bell's competitors will be subsidizing Bell and they will be placed at a competitive disadvantage. On the other hand, if the contribution rate is set too low, the reverse will hold.

The only sure way for the CRTC to ensure that all competitors are in fact paying the same contribution, would be to restructure the industry by creating monopoly local/access facilities companies that are separate from the competitive companies that provide all

telecom services. The competitive service companies would be permitted to own long distance facilities, but not local/access facilities. This separation would place all competitive activities at arm's length from monopoly activities. As a result, only the local/access facilities monopolies would have to be subject to price regulation. Also, there would be no need to determine the level of contribution of the monopoly carriers through a cost allocation methodology. Instead, a contribution level could be set on policy grounds, and there would be no question that all competitive long distance carriers would then be paying the same true level of contribution, or at least would have their contribution determined by a consistent method.

Without this regulatory and industry structure innovation, the CRTC will have to continue to estimate the contribution rate by using the somewhat arbitrary cost allocation methods that were established for setting monopoly rates. While that approach may be reasonable for determining equitable rates for the different services offered by a single firm, and for the rates that should be charged to different classes of customer, it is not adequate for determining the contribution rate that will result in a level playing field among competing firms.

4.3.1 Effective Regulation of Construction Programs

The process used to regulate Canadian telephone companies consists of two types of hearings: revenue requirement hearings (or applications for general increases in rates) and annual construction program reviews.

Revenue requirement hearings are the principal regulatory instrument available to the CRTC (and other telephone regulators such as the Public Utility Board of Manitoba). However, in an era when the cost of electronic equipment is declining, expansion of the existing network can reduce average costs, even when there is a moderate level of

inflation in the economy generally. Consequently, general rate increases may not be required and the telephone companies may not initiate revenue requirement hearings.[29]

If per unit costs are declining and rates are constant, the rate of return will increase, all other things being equal. If so, the company's rate of return will increase. If the rate of return increases to a level that exceeds the upper limit of the range allowed by the regulator, the regulator could initiate a hearing to reduce rates.

Under these circumstances, the regulated company may well choose to undertake investments that are driven by strategic considerations such as those discussed in Section 3. Although these investments will increase the company's revenue requirement in the short run, they will be riskless and costless to the company if they only increase costs enough to keep the earned return on equity within the allowed range and avoid an imposed rate decrease. As long as the resultant costs do not force a rate increase, the impact on rates will not be scrutinized since there will not be a revenue requirement hearing.[30]

From the perspective of many consumers, a rate reduction may be preferred to the company's strategic investments that increase the company's dominance in the telecom marketplace, increase its ability to meet future competition, preempt competitive entry and help eliminate competitors that do enter the market.

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[29] Rates for specific services, other than basic services, can be changed without a full revenue requirement hearing. Also, the basic rates paid by residential and business customers may increase through "rate group creep." That is, as the number of network access services (NAS) increases over time due to population growth and expanded local calling areas, exchanges can move into higher rate groups. Higher rates groups have higher basic service rates.

[30] Bell Canada did not have a revenue requirement from 1983 until its 1993 application for a revenue requirement hearing.

The other element of the regulatory process for telephone companies is the annual construction program review (CPR). The purposes of the CPR process were clearly enunciated by the Commission over a decade ago. It identified three objectives:

> (i) to provide information that is useful in determining the appropriateness of the methods employed by the company in developing its proposed construction program and in assigning priorities for expenditures;
>
> (ii) to provide information on the steps taken by the company to ensure that the proposed expenditures are consistent with these methods; and
>
> (iii) to afford an opportunity for interested parties to express their concerns on the proposed construction program itself, and to provide a forum for an exchange of views among such interested parties, representatives of the company and Commission staff.[31]

The Commission later added a fourth objective:

> to provide the Commission with sufficient information to assess the reasonableness of the construction program.[32]

More recently, the Commission identified the tests to be used to assess the reasonableness of the construction programs.

> For projects that are triggered and driven by growth, incremental costs are examined and assessed in relation to the forecast change in demand. In

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[31] CRTC Telecom Public Notice 1981-4, p. 2.

[32] Telecom Decision CRTC 81-15, as reported in 7 C.R.T. 851, at 861-2.

> such cases, the Commission expects the most cost-effective method to be chosen.
>
> Other projects, such as those within the programs category, are assessed primarily on the basis of an investment analysis and an evaluation of ancillary benefits. Specific programs involving modernization or productivity improvements are also reviewed on an ongoing basis by means of expenditure variance analyses. These analyses include comparisons on a year-over-year and actual-over-forecast basis.[33]

Of key importance in controlling the inefficient strategies that are discussed in section 3, is effective regulation of the capital expenditures of the partial monopolist telecom companies. This can only be accomplished if the CPR process is an effective regulatory forum. If it is effective, then the regulator can ensure that the efficiency benefits of technological change and competition are maximized and that rate impacts are equitable across rate classes (i.e., the benefits of modernization and competition are equitably distributed among customer classes).

The purpose of the CPR is to enable the regulator to determine the reasonableness of a company's construction program. To do that, the regulator must, among other things, determine whether the company's economic studies, which are used to justify major programs, are reasonable. Unless the economic studies are reviewed in detail, the economic justification for capital expenditures must be taken on faith. Once a capital program is accepted in a CPR and the expenditure is made, the costs flow directly through to the company's revenue requirement over the useful life of the capital facilities. Errors in economic studies can result in unintended cross-subsidies of certain capital facilities and, therefore, the services provided by those facilities.

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[33] Telecom Decision CRTC 89-4, pp. 18-19.

To assess the reasonableness of an economic study it is necessary to review all of the assumptions on which it is based. While the discount rate, the time horizon used and other global assumptions revealed in the economic study information filed for a CPR hearing are important to consider, the assumptions that are most likely to be controversial are those that relate to the year-by-year cash flow information that underpins the studies. Without this information, it is impossible for the CRTC and intervenors to determine the magnitudes of the projected incremental revenues and incremental cost savings that make up the benefits of the investment, for example. It is also impossible for them to determine the rate at which revenues and cost savings are assumed to grow over time.

While it must be recognized that the economic studies are based entirely on projections and, as a result, it is very difficult to prove that any assumption is not valid, regulators can assess whether the projections fall within an acceptable zone of reasonableness. Where there is limited experience on which to base these projections, as happens with the projected demand for a new service, the zone of reasonableness may inevitably be quite wide. This makes any *a priori* evaluation of economic studies difficult. However, even if regulators and interveners are forced by necessity to give the companies a great deal of leeway in the assumptions used in their economic studies, the track record of each company can be assessed over time. If a consistent bias is observed, the regulator can then use a company's past performance in making its projections for economic studies as a reference point for evaluating future economic studies.

A further problem with the current CPR process is the inadequacy of the existing procedures for tracking the performance of major capital programs. To evaluate the construction program, interveners and the CRTC require data that provide insight into the "performance" of the company's past forecasting. For example, regular reviews of programs and strategic initiatives on an "actual-over-forecast basis" are essential to the development of a track record for the company. The track record of the company with respect to its past projections of the net benefits of strategic initiatives could be the most

useful tool for evaluating projections of the net benefits of programs and strategic initiatives in the future.

Tracking capital expenditure drivers is a well-established practice in the context of growth related expenditures. All telephone companies provide the CRTC with their forecasts of growth in demand (NAS, traffic, etc.) which can be compared to their actual results in future years. Over time, the companies establish track records showing whether they tend to over-forecast or under-forecast growth. The track record shows how accurate the companies' forecasting techniques are and whether their forecasts are biased. Comparable actual-over-forecast comparisons are needed for the drivers underlying strategic initiatives and other major capital programs.

The necessary tracking could be done if the partial monopoly telecoms were required to provide the revenue and cost projections used in their economic analyses in a form that later can be compared to actual results in a meaningful way. Economic studies often measure incremental costs and benefits. These cannot be tracked. However, the incremental costs and benefits are derived from the assumed total costs and benefits for two alternatives (i.e., with and without the investment being considered). Therefore, total revenues by service could be provided, for example, as well as the incremental revenues, for each strategic initiative that has been undertaken.

In addition, annual filings should include all actual results required by the Commission and interveners to evaluate the accuracy of the forecasts used by the company to justify its capital expenditures for programs and strategic initiatives in previous years.

A further limitation of the CPR process is the absence of rate impact information from the CRTC's CPR process. as noted above, the CRTC has said that the assessment of strategic initiatives should include "an evaluation of ancillary benefits." To many consumers, an ancillary benefit (or cost) of programs and strategic initiatives is their impact on rates for basic services. While these investments are undertaken in part to

provide new and improved services, a key consideration is their profitability. Unprofitable service improvements generally are not undertaken. To the extent that the profitability of a strategic initiative is a central justification for approving it, it is reasonable for the CRTC to ensure that the net benefits are distributed equitably. At the very least, an equitable distribution of the net benefits should mean that no rate class is made worse off by a major capital program.

Of course, the decision with respect to the economic feasibility of a project rests solely on the economic analysis. Investment decisions should not be dependent on the rate impacts. As the Commission has stated:

> The Commission is aware that investment decisions have a significant downstream impact on the revenue requirement and the distribution of costs and revenues among Phase III categories. In assessing the capital program, the Commission operates on the premise that, if growth is met using the technology that is most economical in the long-run, and if program expenditures have a positive NPV, the revenue requirement over the life of the investment should be minimized. The tests of reasonableness have been established on this basis.[34]

However, when strategic initiatives are undertaken, their net financial benefits should be equitably distributed. In particular, if a major investment primarily benefits business customers, it is reasonable for residential customers to expect at least to be protected from rate increases resulting from that investment. Rate impact information would serve as useful and relevant information in a rate hearing following the acceptance of a strategic initiative. That information is needed to ensure that the distributional impact of large capital programs is equitable.

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[34] Telecom Decision CRTC 90-27, p. 30.

To illustrate, it may be noted that it is not the intent of Phase III costing to enable the company to invest vast sums in modernizing its network to improve its strategic position within the competitive market while allocating costs so that residential customers, who rarely require or use the unique capabilities of a digital network, bear a disproportionate share of the costs of modernization. The rate impacts of strategic initiatives should be explicitly considered in the revenue requirement hearing to ensure that the existing procedures for allocating the costs of strategic initiatives are appropriate.

Put simply the question of "Who pays for, and who benefits from, strategic initiatives?" should be explicitly considered in the revenue requirement hearing, especially in cases where discretionary strategic initiatives, driven in part by competitive pressures, are involved.

5 SUMMARY AND CONCLUSIONS

The Canadian telecommunications industry has been transformed by the technological changes, notably digitalization, which have occurred in the past decade. The capabilities of digital switching and fibre optic transmission facilities are revolutionizing both the services offered by telecommunications firms and the role telecommunications serves in the everyday activities of businesses and individuals.

This technological revolution has led as well to a regulatory revolution. The most notable regulatory change is the growing importance of competitive activities, particularly for the telephone companies that were, until quite recently, comfortable monopolies.

From a technological perspective, the telecom industry has already reached the point that the only natural monopolistic activity is the provision of local/access (telephone and cable TV) facilities. Competition is technologically feasible for all telecom services including local telephone and cable services. It is probable that even local/access services will not remain monopolistic into the next century. As digital, radio-based telecom technology matures, its costs can be expected to decline to the point that it will become competitive with hard wired facilities. Despite the attention being given to the prospect of fibre to the home, which is not yet economically justifiable, it is possible that that development will be overtaken by radio-based technologies.

The technology of competition has progressed so rapidly, that the major constraint on competition in the Canadian telecom market is regulation rather than technology. The market structure of the industry continues to be shaped primarily by the regulatory framework within which it must operate, at least in the short run. In the long run, the underlying forces of competition are likely to prove irresistible. Competition will continue to set the regulatory agenda. While regulation can cause a lag in the pace of growth of competition, bypass opportunities force the regulatory environment to adapt.

For the time being the telecom industry will continue to be made up primarily of partial monopolies - that is, facilities-based firms (i.e., the telephone and cable TV companies) offering both monopoly and competitive services. For the telephone companies, competitive services now account for most revenues. Furthermore, competitive services provide the greatest opportunities for future growth in the industry.

The partial monopoly telecom firms have an incentive to employ various strategies that exploit their local/access monopoly to enhance their competitive position in providing competitive telecom services. In particular, they can be expected to attempt to cross-subsidize their competitive activities with monopoly revenues. In the context of local and toll voice services, this strategy translates into a desire to reduce the level of contribution that long distance voice service pays toward access costs, especially in comparison to the contribution charge that is levied on their long distance voice competitors.

A second opportunity that the partial monopoly telecom companies can be expected to exploit is the fact that the risk associated with their investment in facilities used in the competitive market is borne primarily by monopoly customers instead of investors. As a result, the investors in the Stentor member partial monopolies are much less concerned about the risks associated with making massive investments in new facilities to serve the competitive market than might the investors in their non-monopolistic competitors. This phenomenon results in the partial monopolists being willing to invest in modernization prematurely (earlier than is economically optimal) in the hope of preempting competitive entry. Preemptive modernization works in two ways.

First, it can help partial monopolist establish such a dominant presence in the competitive markets that potential competitors will be discouraged from entering. In addition, by (i) investing in adequate capacity to serve the entire market, (ii) investing in facilities that enable capacity to be increased very cheaply, and (iii) keeping the facilities sufficiently up-to-date that the rate of facilities retirement is low, it may be possible to convince the regulator that it would be uneconomic to allow competitors to invest in competing

facilities. This is just one strategy that can be used to restrict the scope of competition that illustrates the concern that regulatory protection can be the most effective way for a partial monopolist to protect its market share in the telecom market.

Both modernization and competition tend to enhance the efficiency of the telecom market. The efficiency gains resulting from increased competition are attributable in large part to the unavoidable discipline of the competitive market. While regulation can simulate the efficiency of the competitive market in theory, in practice the tools available to regulators for identifying and disallowing inefficient expenditures are quite ineffective compared to the "invisible hand" of the competitive marketplace. Even incentive regulation, which uses a form of the "invisible hand," investor risk, to encourage efficiency has a down side. Unlike the competitive market, incentive regulation rewards regulated companies for improving their efficiency through allowing them above-normal profits even if their efficiency gains do not surpass the industry norm. The reward is a cost to consumers. In a competitive industry, prices tend to decline by an amount that reflects normal efficiency gains.

Because technological improvement and competition enhance efficiency, there is an opportunity for all telecom consumers to benefit. However, the competitive strategies that partial monopolists can be expected to use tend to distribute the efficiency gains unequally. The partial monopolists have a strong incentive to flow as large a share of the benefits as possible through to the competitive market. There is no incentive to use the efficiency gains to reduce rates, or restrain increases, for monopoly services.

The only way that the benefits of technological advancement and competition in the telecom industry will be equitably distributed between monopoly and competitive services will be if regulation is effective. Unfortunately, the increasing significance of competitive services is making regulatory control less effective.

The current regulatory system is designed for setting rates based on established cost allocation procedures. That is not the way in which rates are set for competitive services and new add-on services. Those rates are set to maximize revenue, given market conditions. While allocated costs can be determined by relatively objective analysis, the assessment of market conditions is quite subjective. The regulators have much less freedom to reject the company's assessment of market conditions than it does to establish a cost allocation methodology. To make matters worse, the current CPR process used by the CRTC does not require the companies to provide enough information to effectively assess the reasonableness of the economic studies used to justify investments in major programs, or the equity of the way in which Phase III costs associated with those investments, and related risks, will be allocated among customer classes, given the allocation of the benefits of the investments. Costs are allocated, in part, by arbitrary regulatory rules, while benefits are allocated by market demand. This is a concern because under the current regulatory structure, residential customers bear much of the cost and risk associated with the investment in the new competitive services that primarily address the demands of the competitive business telecommunications marketplace.

With diminishing control over rates and inadequate protection against investments that are driven in part by strategic considerations that favour competitive services over monopoly services, the effectiveness of regulation will be compromised unless the regulatory and industry structures are adapted to reflect the new technological and competitive realities.

The most promising innovation would be to require a restructuring of the telecom industry so that monopoly local/access facilities providers operate at arm's length from competitive service providers. With this industry structure, all telecom services (i.e., data, long distance voice, local/access voice, cable TV, etc.) could be provided competitively, using facilities leased at regulated rates from the local/access facilities monopolies. Rate regulation for all services, and for toll facilities could be phased out as competitive service

providers become established in each regional market. The only rates that would have to be regulated would be the rates that the local/access facilities monopolies charge the competitive telecom service providers.

An important benefit of this structural innovation would be that the contribution rates that long distance voice and other services pay toward the cost of access facilities could be established based on public policy principles. The desired level of contribution would be sustainable because all of the competitive service providers would be operating under identical contribution rules.

Under the current regulatory structure, it will be almost impossible to ensure that the level of contribution borne by the Stentor member companies will be consistent with the contribution charges being paid by the competitive facilities-based long distance providers and resellers. If the levels of contribution are not consistent, either the Stentor companies or their competitors will have a competitive advantage. That could compromise the stability of the competitive market and could lead to reductions in the level of contribution without regard for the public policy considerations that have resulted in the existing contribution mechanism.

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