
DEPARTMENT OF COMMUNICATIONS

report

**economic and market analysis
of brokerage and resale
in the telecommunications
carrier industry**

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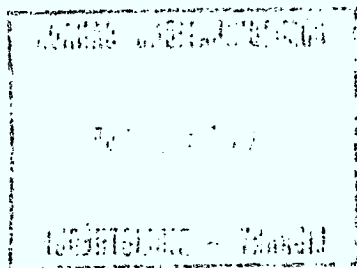
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
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ECONOMIC AND MARKET ANALYSIS OF BROKERAGE AND RESALE
IN THE TELECOMMUNICATIONS CARRIER INDUSTRY-----

Dear Mr. MacEwan:

Enclosed please find our report for the above study.

Sincerely yours,

for 
Steven Globerman
Managing Director
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ECONOMIC AND MARKET ANALYSIS OF BROKERAGE AND RESALE
IN THE TELECOMMUNICATIONS CARRIER INDUSTRY

Techno-economic Research Unit

April 12, 1985

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The subject of reselling and sharing is characterized by a dearth of published data and analysis. Consequently, the co-operation of numerous individuals in the industry was required to obtain even basic information on the subject.

While there are too many people to single out for their co-operation, the following individuals were especially generous with their assistance: W.B. Adams - Datel Ltd.; Mac Campbell - Mac Campbell and Associates; Gordon Cameron - B.C. Telephone; Don Hepburn - Vancouver General Hospital; Jim Hudson - Imperial Oil Limited; Pat Learmonth - The Canadian Bankers' Association; Gerry Mc Andrews - Alltel; Ian McGibbon - Bank of Montreal; Jim McGraw - B.C. Rail; Phillip Siller - Olympia and York; Jim Tobin - Lexitel Inc.; Al Wallace - Bell Canada.

The analysis, conclusions and shortcomings of the study are, of course, solely the responsibilities of the authors.

TABLE OF CONTENTS	Page

ACKNOWLEDGMENTS	
INTRODUCTION	1
Definitions of Reselling and Sharing	3
Hypotheses Concerning The Impacts of Liberalizing Restrictions on Reselling and Sharing	4
Impact on Telephone Rate Structure	4
The Potential Impact of Liberalized Resale and Sharing: Economic Impacts	4
Impact on Costs	5
Introduction of New Services	7
Quality of Service	8
Revenue Implications of Resales and Sharing	9
The Goss, Gilroy (G&G) Survey	11
The Scope For Competitive Reselling	12
The U.S. Experience With Resale	16
INTERVIEWS WITH POTENTIAL CANADIAN PARTICIPANTS	
Introduction	21
Preliminary Interview Results With Canadian Firms	21
The Dynamics of Reselling and Sharing: Their Policy Relevance	22
SURVEY - OVERVIEW	
Introduction	24
Profile of the Respondents	24

SURVEY RESULTS	26
The Potential Dynamics of the Resale Market	26
Potential Resellers	27
Market Potential and Pricing Structure	28
Motives for Resale and Sharing	29
Responses of Regulated Carriers	31
Resale Competition and Interexchange Competition	32
 SUMMARY OF SURVEY RESULTS	 34
Revenue Implications of Resale and Sharing	34
The Effects of Liberalizing Sharing	35
The Effects of Liberalizing Resale	36
 EVIDENCE FROM THE INTERCONNECT INDUSTRY	 38
Introduction	38
The U.S. Experience	38
Interconnect In Canada	40
Competition in the Telephone Directory Business	42
Deregulation and the Transportation Sector	43
 POLICY ALTERNATIVES	 45
Permit Shared Use and Resale Without Restriction	45
Permit Shared Use and Resale With Restrictions	46
Comprehensive Restrictions Against Resale and Sharing	48

CONCLUSIONS	49
Suggested Extensions of Study	51
FOOTNOTES	F1
APPENDIX A	A1
APPENDIX B	B1
APPENDIX C	C1

LIST OF TABLES	Page

Table One: Sectoral Distribution of the Respondents to Our Structured Survey	25
Table Two: Price Relatives Reported by BC Tel	28
Table Three: Rate Relationship for Private Lines	29
Table Four: BC Tel - Originated Business Long-Distance Traffic	29
Table Five: Bell Systems and Competitive PBX KTS Systems	39

INTRODUCTION

The Canadian telecommunications industry is currently at a policy cross-roads. Technological and economic forces are creating opportunities for competition in various stages of the industry that to date, have largely been the quiet preserves of "natural monopolists." (1) At the same time, policy makers are confronted with the potential for large and undesirable social outcomes associated with a substantial liberalization of the industry's current regulated structure. It is between the conflicting pressures for regulatory change and the pressures to protect long-standing policy objectives (such as universality) that policy makers in both Canada and the United States have been attempting to steer a course.

To date, the direction of recent policy changes in North America has been in favour of allowing greater scope for competition in the telecommunications industry, albeit both the speed and magnitude of deregulation has been substantially more dramatic in the U.S. than in Canada. (2) In reviewing the current regulatory regimes in the two countries, perhaps the most striking difference is the substantially more liberalized environment in the U.S. for competition in interexchange voice and data services. This more liberalized environment encompasses not only the existence of competitive interexchange carriers, but also virtually unrestricted reselling and sharing of basic and enhanced telephone service. Reselling competition is provided both by Other Common Carriers (OCCs) and by "pure" resellers. The latter may be thought of as companies which do not control the utilization of any of the underlying capacity used to carry messages. Reselling by facilities-based carriers has become the dominant form of reselling in the U.S.

It is no coincidence, therefore, that interexchange competition has moved to the forefront of the Canadian regulatory agenda. While the regulator's position on this issue is undecided, at the present time, it is virtually certain that the issue will remain a prominent one for the foreseeable future, as will the issue of liberalizing resale and sharing. The inclusion of the reselling issue in the recently concluded examination (by the CRTC) of CNCP's Application for interchange of Traffic with Public Switched Telephone Networks (filed 25 October 1983) highlighted the basic importance of resale

and sharing in the context of deregulation. Indeed, it might be argued that the significance of reselling and sharing as competitive activities has, to date, been underemphasized by Canadian policymakers. This assessment is supported by the paucity of research focussing on the resale and sharing activities, per se. (3) The emerging prominence of these activities in the U.S. suggests, however, that the potential implications of liberalizing restrictions on reselling and sharing are substantial. In this spirit, the objective of our study is to consider the potential allocative and distributional impacts of a liberalized reselling and sharing environment in Canada.

This study is concerned with evaluating the potential allocative and distributional consequences of liberalizing restrictions on reselling and sharing - recognizing the implications of alternative background assumptions regarding interexchange competition and rate rebalancing. Allocative consequences primarily encompass considerations of efficiency. The relevant policy question in this regard is whether resources would be allocated more efficiently (in both the short-run and the long-run) under a liberalized reselling and sharing environment. An important aspect of this question are the potential market dynamics of liberalization, including entry and exit of service providers, introduction of new products and services, price changes, changes in the quality of service and so forth.

Distributional consequences are concerned with the groups in society that gain and the groups that lose from a change in public policy. In the context of the telecommunications sector, an important policy objective is universality of service. While universality has never been precisely defined, it seems fair to conclude that policies which threaten substantially higher telephone bills for significant numbers of residential subscribers will be viewed unfavourably in the public policy context, even if they promise large efficiency gains. This caveat is particularly relevant when residential subscribers likely to be adversely affected have below average incomes. In a related manner, a policy which conferred benefits on a relatively small group of subscribers, would be inferior to a policy with widely distributed benefits, other things constant. Thus, the potential distributional consequences of a liberalized reselling and sharing environment constitute a relevant issue for this study.

Definitions of Reselling and Sharing

A fairly common set of definitions exist for the resale and sharing activities. The most standard definitions describe resale as an activity wherein an entrepreneur subscribes to the communications services of a common carrier and then re-offers services to the public; however, this definition glosses over a distinction between whether or not the reseller actually controls the utilization of a communications facility. When the reseller merely acts as an intermediary between the underlying carrier and an end user, who ultimately controls the utilization of the communications facility or service, the reseller is acting as a broker. On the other hand, the resale processor retains continuous control over the utilization of services and facilities furnished by the underlying carrier.

Resale can be based on a variety of motives. In one case, resellers subscribe to the bulk offering of carriers and resell individual channels at a rate below the carriers individual channel rate but, in total, above the bulk rate. Similarly the reseller could acquire a broad bandwidth or high data speed channel from the underlying carrier, add multiplexing equipment and resell narrower bandwidth or lower data speed channels to end users. In a third (most common case), the reseller buys a discounted public switched network service such as WATS and resells it as DDD service.

In any version of reselling, the reseller can "add value" to the basic transmission service provided. Trying to define the minimum amount of value which is necessary to constitute a service as "enhanced" is a difficult task. As we will expand upon in a later section, it is unclear whether any unambiguous definitions can be specified or even agreed upon after-the-fact. But for purposes of illustration, most observers would agree that adding packet switching to a network constitutes a value-added service. For purposes of this report, we define a value-added network service as a network which augments (adds value to) the service of any underlying carrier to improve network performance.

Sharing may be defined as a non-profit arrangement in which two or more users jointly use the services of a carrier in order to reduce their individual costs. Each user pays the communications related costs according to its pro-rata usage of such communications services. A

"user association" is a group of users who have banded together in a non-profit arrangement for the purpose of securing service.

The traditional distinction drawn between resale and sharing is that in the case of resale a profit is made, but not in the case of sharing. As Criner (1977) notes, the sharing issue is dominated by resale, in that should a pro-resale policy be established, sharing would follow, while the converse is not true. For a bona fide sharing arrangement to exist, each sharer must have a communications requirement of its own for the service to be shared, unrelated to the sharing arrangement itself or a desire to resell the service. For analytical purposes, Criner suggests that sharing through a user association be looked upon as non-profit resale. (3a)

Hypotheses Concerning The Impacts of Liberalizing Restrictions on Reselling and Sharing

While there is (as noted above) a remarkable paucity of focussed research on the issue of liberalized resale and sharing, there is no shortage of hypotheses concerning the likely impacts of any such liberalization in the Canadian environment. Much of the relevant debate was carried out during the recently concluded hearings into CNCP's Application for Interchange of Traffic with Public Switched Telephone Networks.

Impact on Telephone Rate Structure

There is widespread agreement among observers that the liberalization of reselling and sharing restrictions (especially for basic long-distance voice service) will lead to a closer correspondence between the prices of different services. In more specific terms, the prices of bulk-discounted services, such as WATS and Telpak, are likely to rise, relative to the price of DDD service. (4) There is much less agreement, however, concerning the likely impact of resale and sharing on the costs of providing various types of telephone service, as well as on the total revenues earned by the common carriers.

The Potential Impact of Liberalized Resale and Sharing: Economic Impacts

The potential impact of liberalized reselling and

sharing on the costs of providing telecommunications services is complex. At the outset, it is necessary to distinguish between pecuniary cost savings and real cost savings. The former refers to savings in costs for certain groups of consumers that come directly at the expense of profits for certain groups of producers. In effect, pecuniary cost savings are essentially a redistribution of income and are not associated with short-term or long-term efficiency gains. On the other hand, real cost savings refer to reductions in the resources required to produce and distribute a given quantity (and quality) of output. Allocative efficiency gains are associated with real cost saving.

Impact on Costs

The literature on reselling and sharing is somewhat vague in distinguishing between potential real and pecuniary cost savings. For example, it is recognized that sharing capacity would permit users (especially smaller users) to split bulk communications costs, thereby availing themselves of attractively priced services. (5) In a related vein, with reselling, bulk services would be supplied on a usage-oriented basis, presumably at lower rates than current MTS rates. In these examples, resale and sharing allow subscribers to enjoy bulk service discounts without necessarily purchasing the entire bulk service. This type of arbitrage represents pecuniary cost savings but not necessarily real cost savings, unless the arbitrage activity was associated with significant changes in resource allocation patterns.

In some discussions of the issues, an explicit relationship is recognized between price arbitrage and resource allocation patterns. For example, it has been argued that the closer aligning of prices with the marginal costs of providing service which resale and sharing encourages allows for a price structure which provides better signals for telecommunications investment decisions and may result in greater overall network efficiency. (6) It is a fairly familiar economic paradigm that when services are not priced at their marginal social costs, either too much or too little of those services will be produced. To the extent that reselling and sharing encourage a closer correspondence between prices and marginal costs for various categories of services, they help promote a more rational allocation of scarce resources. Of course, there is a potentially

important caveat to this argument. Namely, if the existing telcos are willing to "rebalance" their rate structures and are being prevented from doing so by regulatory constraints, this anticipated benefit from liberalizing restrictions on reselling and sharing could be more cheaply obtained by allowing telcos greater flexibility in setting their rates.

Some of the alleged efficiency benefits of reselling and sharing come not from price arbitrage, per se, but from the additional competition generated. A general statement of this position is offered by Wilson, who argues that reselling increases the speed with which the intercity communications market becomes workably competitive. Becoming a reseller is a fast, relatively inexpensive way of entering the intercity market, either as a facilities based or non-facilities based carrier. Easier entry conditions promote workable competition (or "contestability") which, in turn, leads to benefits to the public primarily in the form of lower rates. (7)

In a similar vein, the Director of Investigation and Research, Combines Investigation Branch, has argued that competitive entry through resale, sharing and interconnection will improve efficiency, with resulting declines in the long-run costs of interexchange and intraexchange services. The Director believes that resale and sharing have a particularly important role in introducing competition to intraexchange services. Specifically, direct broadcast satellite, coaxial cable, cellular mobile radio and local area networks represent a few of the emerging technologies and bases upon which resale and sharing can expand. (8)

The efficiency gains alluded to by Wilson and the Director of Research represent real savings in resources which contribute to improvements in social welfare, holding distributional considerations constant. The mechanisms by which competition encourages real cost savings are discussed extensively in the economics literature. In the context of the telecommunications industry, several hypotheses may be raised. One is that the prospect of increased competition will force telcos to be more conscious of costs and of reducing costs. Another is that the introduction and spread of new cost-reducing technology will be stimulated by actual and potential competition.

The real cost savings associated with resale and sharing are therefore seen to depend upon the extent to

which liberalizing relevant restrictions will stimulate entry and the resulting behavior of entrants and telcos. To be sure, not all industry participants believe that new entry will contribute to real cost savings. For example, CNCP suggests that the quality of basic transmission in non-MTS/WATS services is already subject to market tests and resale would not bring any additional market discipline to these services. Indeed, resale could actually decrease the degree of market discipline by weakening CNCP and thus reducing the effectiveness of competition between common carriers. Resellers can create competitive pressures in the designing and marketing of end-service packages, but these components can be minor aspects of the total cost composition of telecommunications services. (9)

B.C. Tel goes further in arguing that increased competition would require additional resources to service alternative common carriers and resellers' needs. Overall efficiency could be expected to decline due to the increased number of participants, the increased complexity of the networks, and the splintering of traffic between carriers. In particular, the backhauling of messages to the reseller's switch creates a need for additional transmission capacity and for extra switching of messages. Obviously, to the extent that reselling activity is motivated primarily by an uneconomic rate structure (i.e. DDD rates that are too high relative to cost), the additional costs imposed by resellers are of a "deadweight" variety and represent a significant social inefficiency. B.C. Tel emphasizes that while additional competition before rate rebalancing could well result in an increase in the long-run cost of supplying telecommunications services, this risk is minimized with rate rebalancing. (10) It is minimized further by charging competitors for the full costs of access and switching they induce.

Introduction of New Services

Another important aspect of consumer welfare is the introduction of new products and services that more closely match the tastes and preferences of consumers. In this regard, it has been suggested that reselling competition would contribute to finer differentiations of tariffs with respect to duration of calling, time of calling, frequency of calling, and so forth, all of which permit a closer correspondence between consumer tastes and product availability. Recognizing this feature of

rate flexibility raises the question of whether there is a significant market demand for special billing and tariffing procedures that is not being met by the common carriers.

Other participants in the policy debate stress the opportunities for introducing new value-added services. One broad area involves data services, including the interconnection of voice and data facilities, encrypting voice and data, and credit checking. Others are related to broadband services such as teleconferencing and electronic mailboxes. While telcos argue that they are currently able to offer many of these services, the majority of economists would probably agree with the following assessment by the OECD:

"Historically, public monopolies have been efficient in providing relatively undifferentiated infrastructure type services uniformly over a wide geographical area: while markets with competitive entry have proved efficient in catering to highly differentiated demand by offering a broad range of price - quality combinations." (11)

Manley Irwin has also stressed that new entrants, whether specialized carriers, value added carriers, satellite carriers, terrestrial resellers and satellite resellers are likely to be unconventional and entrepreneurial. (12) While opponents of reselling might be willing to concede that specialized carriers may introduce "niche" services, most potential resellers see resale as a backdoor to becoming common carriers.

Quality of Service

Still another consideration in evaluating the allocative effects of liberalized reselling and sharing is the quality of basic telephone service. B.C. Tel has suggested that some resellers would offer service of an inferior quality, connection integrity and reliability, and (as such) it would expect overall network integrity to decline from current levels. This degradation would be exacerbated by the entry of new resellers who did not have substantial communications experience or expertise. (13) On the other hand, it has been suggested that competitive entry through resale, sharing and interconnection will improve service quality. And at least one common carrier has indicated that as long as

arrangement are made to have properly engineered connections and the resale and resharing company uses approved equipment for subdividing the bulk facilities, there should be no impact on the quality of the company's various services. (14)

It should be noted that a reduced quality of basic service would not necessarily imply a lowering of consumer welfare, provided that the consumers affected were willing to accept lower quality services - presumably for concomitantly lower telephone rates. Consumer welfare would be adversely impacted if the lower quality service was not demanded by the consumers affected but (rather) was the artifact of supplier negligence. This distinction is drawn in a report by Peat Marwick who argue that the quality of service (in relation to price) that has been provided by the telcos in the MTS sector has had such an excellent track record (with regard to such factors as provision of capacity, quality of transmission, and so forth) that relatively little room appears to be left for further improvements. Peat Marwick argues that the ability of a competitor to offer "second class" service at a very low price may be a more important advantage of competition than offering "first class" services, especially since telephone companies have in the past not been seen to offer special low - quality discount services (or may have been prevented by regulation from doing so). (15)

Revenue Implications of Resale and Sharing

The implications of liberalizing current restrictions on resale and sharing for total industry and common carrier revenues have been an important subject of concern for policy makers. The basic concern is that with liberalized resale and sharing - total toll revenues will decline, thereby eroding the basis for alleged cross-subsidies from toll services to local services. While the magnitude, as well as the welfare effects, of these cross-subsidies are subject to debate, it seems reasonable to conclude that until an acceptable "rate-rebalancing" scheme is put in place, a policy change that threatened to undermine the basis for subsidies to the local sector would probably be seen by policy makers as having undesirable distributional implications.

Perhaps the most comprehensive treatment of the revenue implications of resale and sharing is found in a Bell Canada submission regarding CNCP's Application for

Interchange of Traffic with Public Switched Telephone Networks. Bell draws its implications based on the U.S. experience and marketing judgement. It notes that the U.S. experience would be somewhat comparable to permitting resale by all parties in conjunction with granting the CNCP application for MTS interconnection. Bell estimates that approval of resale in the absence of rebalancing and in the absence of a direct competitive response to resale could result in an additional impact on the company's originated revenues in the order of \$15 million in 1990 and \$60 million in 1995. The company notes that these estimates might be understated, since relatively large volume discounts from MTS are currently available through Bell Canada services such as Telpak as compared to discounts that have been available to resellers in the U.S. (16)

If the CNCP application is not approved, Bell believes that the impact of resale would likely be substantially higher than noted above. Resellers would not have to compete with CNCP to attract customers from Bell. Even if the CNCP application is rejected a large service provider, possibly a CNCP subsidiary, could lease CNCP bulk facilities and interconnect then to Bell local access facilities through its own switches to potentially provide all types of service that a competitive carrier could provide. In such a case, the impact on the company's revenues of resale alone might approach that estimated for allowing CNCP interconnect: \$200 million in 1990 and \$700 million in 1995. (17) The company has not conducted a specific analysis of the impact of resale for the purpose of providing dedicated services versus resale for the purpose of providing MTS/WATS alternatives. However, given the relative size of the two markets, it is not unreasonable to conclude that resale for the purpose of providing dedicated services would represent a proportionately smaller impact.

Bell Canada's position is essentially that the loss in revenues on MTS business would be substantially greater than any gain in net revenues from additional leasing of bulk circuits. This presumption follows from Bell's view that demand for different categories of long-haul service is price inelastic. (18) In a later section, we will explore more formally the relationship between elasticities of demand and the revenue impacts of resale and sharing. For the moment, we would simply note that other industry observers have suggested that total telco revenues (net of costs) would increase along with total industry revenues, notwithstanding that the ratio

of telco revenues to industry revenues could decline.

For example, the Director of Investigation and Research suggests that new interexchange and intraexchange competitive entry, whether through resale, sharing or inter-connection, is likely to result in somewhat lower net revenues for existing carriers that would result absent new entry. This will occur both as a result of competitive cost and price reductions and reduced market share. However, the revenues of existing carriers need not decline in absolute terms, since new sales growth is likely to be substantial and will be shared between existing carriers and new competitors. (19) CNCP, on the other hand, argues that a variety of revenue outcomes are possible depending upon the pricing policies of the existing carriers. Nevertheless, it expects the total revenue of the telcos to remain very much the same after rate adjustment in a scenario in which resale and sharing is allowed. (19a)

The Goss, Gilroy (G&G) Study

Given the very limited amount of published, or, for that matter, unpublished research on the topic of resale and sharing, the G&G study takes on particular significance. Based on their analysis, G&G make certain inferences about the likely Canadian experience with resale. Their main conclusion is that the impact of liberalized reselling of interexchange service will be relatively insignificant compared to the impact in the U.S. The basis for their conclusion can be elaborated with the aid of Diagram One (page 14).

Diagram One shows a number of assumed relationships between number of calls and price per call for two general classes of service: bulk messaging and message toll service (MTS). For purposes of this discussion, bulk messaging may be thought of as a WATS-type service characterized by some minimum monthly rental charge plus (in some cases) block volume discounts. For example, BULK1 might represent a subscription option which provides a WATS circuit for \$X. The circuit offers the subscriber a specific block of unmetered calling time. As long as the subscriber does not exceed the minimum block of time (e.g. 10 hours on the first WATS line rented from B.C. Tel), average price per call-minute will decline continuously to the horizontal axis. (20)

BULK2 represents a WATS-type service with a lower

basic charge for a similar calling zone but with a discounted usage charge that depends upon the number of call-minutes. In this case, the initial (access) charge is lower than the flat charge for BULK1. The charge structure for BULK2 would take the form:

$$1. \text{ BULK2} = (C_{O2} + a(N) + b(M))/(M+N)$$

where a is the usage charge for the first N minutes, and b is the usage charge for the next M minutes. The price per call-minute would presumably decline as long as $C_{O2} > a > b$. But it will decline less steeply than the BULK1 curve.

BULK3 represents another alternative charge structure with a lower access charge than BULK2, but with a usage charge that declines less steeply with volume. This is shown in Diagram One by the BULK3 curve having a lower intercept and a flatter slope than the BULK2 curve.

The limiting case in this sequence would be a tariff schedule for which there was no minimum "up-front" charge, and where call-charges per minute were constant over the relevant calling range. For purposes of this analysis, we assume that marginal costs would remain constant over the relevant calling range. This calling option is identified as MTS1 in Diagram One. The fundamental analysis to follow would not be significantly affected if the MTS1 schedule was modified to acknowledge off-peak calling rates and the like.

The Scope For Competitive Reselling

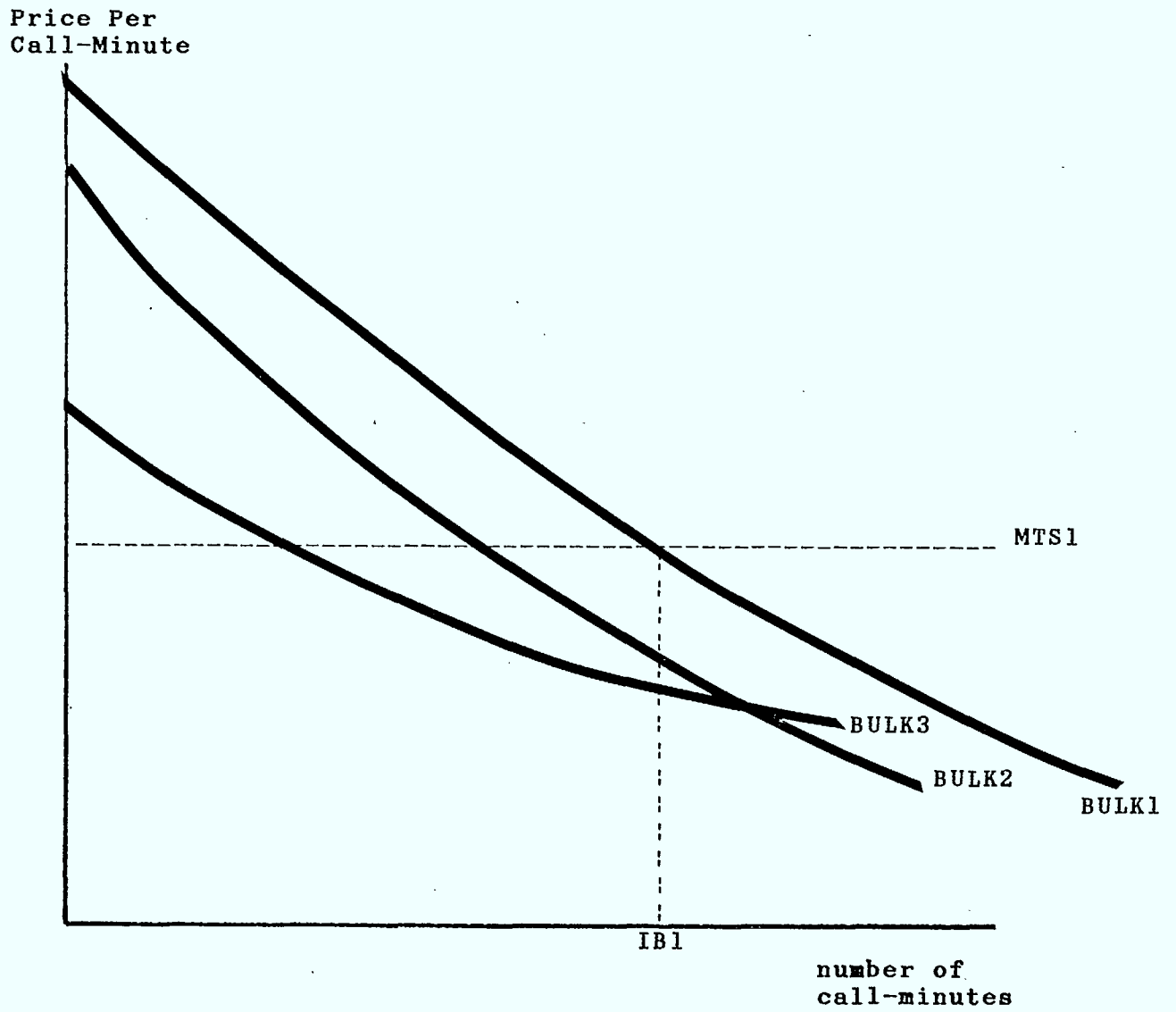
Diagram One captures most of the considerations that influence the likely consequences of liberalizing restrictions on reselling and sharing. Specifically, the area above each of the bulk service curves and below the MTS1 curve shows the potential savings in charges that a reseller could potentially pass-on to a final user-gross of the resellers' other costs of engaging in reselling. For example, a reseller could presumably subscribe to BULK1 from a common carrier. For all call minutes to the right of the intersection IB1, the reseller could charge a price per call minute slightly below MTS1 and realize a mark-up over its average cost of purchased service (given by the relevant point on the BULK1 curve). Thus, IB1 represents the "breakeven" call volume for the reseller trading on the BULK1 option, ignoring any other costs incurred by the reseller. Obviously, a critical

consideration of prospective resellers is the ability to sell a sufficiently large number of call minutes to get over the breakeven volume threshold. In this regard, what seems required is a large market of densely packed subscribers. With thinly populated potential subscriber markets, MTS1 is unlikely to be horizontal over much of call-minutes axis. That is, in order to sell more, the reseller may have to drop its price substantially. Furthermore, the larger the geographic area covered by the reseller, the greater the costs associated with "collecting" and "processing" MTS-type traffic.

With respect to BULK2, the "breakeven" point is realized at a lower cost volume than in the case of BULK1. As a result, profitable reselling can take place in smaller sized markets. This "small-market" property is even more pronounced in the case of BULK 3. It is also obvious that generally lower bulk rates facilitate profitable reselling, while lower MTS rates discourage reselling.

The impact of "adding value" to resold transmission facilities can also be analyzed with respect to Diagram One. For example, if resellers add value to a call, the MTS curve would presumably shift upward, since subscribers would ostensibly be willing to pay more for their calls. If the MTS curve shifts up proportionately more than the resellers' overall costs- including the costs of purchasing "primary service" along one of the BULK options - the profitability of reselling would increase for all call volumes.

Diagram One: THE BASIS FOR RESALE



In Diagram One, the analysis of sharing is analogous to that for reselling. For the sharing activity, the organizer (or the agent that brings sharers together) acts effectively as a reseller. Presumably, if sharing is less costly, in terms of real resource costs, than reselling, the latter activity would be found in the marketplace only if resellers offered value-added services not offered through the sharing option. Since this is a feasible prospect, there may, in practice, be meaningful distinctions between the reselling and sharing options.

In summary, the likelihood of profitable reselling depends on a number of factors:

1. The level of MTS-type rates;
2. The minimum non-traffic sensitive charge for bulk service;
3. The usage-sensitive charges for bulk service;
4. The extent to which resellers can add value to basic service, and the costs of adding such value;
5. The overall size of the subscriber market;
6. The density of the subscriber market;
7. Awareness of resellers' services on the part of subscribers.

The primary focus of the G&G Report is an examination of the likelihood of profitable reselling in Canada under a number of assumed scenarios. While somewhat sensitive to their background assumptions, G&G's basic conclusion is that there are relatively few opportunities for successful penetration of the Canadian long-distance telephone market, especially if common carriers rebalance their bulk and message toll rates. Given the various scenarios they consider, essentially only the very largest resale operations stand any real chance of becoming established.

This market assessment by G&G is predicted upon several key market characteristics discussed above. One is the much smaller size of the Canadian long-distance market, which was estimated to approximate \$4.2 billion in 1982 compared to about \$40 billion in the U.S. Another is the fact that Canada has essentially one east - to - west heavy traffic corridor, while there are several such corridors in the U.S. running both east - west and north - south. Furthermore, "second-level" population centres are "denser" (i.e. more populated per unit of area) in the U.S. than in Canada.

A third consideration is that equivalent Canadian WATS rates are more than twice those prevailing in the U.S., thereby limiting the potential margin available to resellers. However, Bell Canada has argued that the primary discount differential in the U.S. is off-peak because of the off-peak schedule in the U.S. WATS tariff. Business subscribers may be reluctant to use off-peak resold DDD services. Furthermore, Canadian tariffs are characterized by relatively greater discounts on large channel Telpak options.

While (G&G) make a persuasive a priori case against the likely success of simple price arbitrage, particularly for WATS/DDD substitutions, the potential for resellers to employ value added services to expand their potential market merits more extensive consideration. In particular, given a convergence between voice and data transmission technologies, the ability to merge voice traffic with value added data services could significantly expand the potential for profitable reselling. It might also be argued that specialist resellers and brokers would be able to stimulate the demand for reselling services by tailoring prices and service offerings to specialized groups of subscribers. The incentives to share high-volume bulk services may also constitute a more significant influence on the dynamics of the resale and sharing markets than has heretofore been acknowledged.

The U.S. Experience With Resale

In 1976, the U.S. Federal Communications Commission (FCC) adopted a policy favoring the unlimited resale and sharing of common carrier private line facilities and services. In 1980, the opportunity to resell long distance services was significantly expanded by an FCC ruling requiring AT&T to remove restrictions on resale and sharing of WATS services. In both the U.S. and Canada, resale for the purpose of providing enhanced services exists, although common carrier provision of enhanced services is more highly regulated in Canada. (21)

There is a disappointing (although not necessarily surprising) paucity of information on the U.S. experience with reselling. G&G highlight several distinguishing features of the U.S. experience. In particular, the bulk of new businesses (referred to as resellers) were created to purchase WATS services and to resell these services at

a discount to smaller users. Since 1980, the number of resellers has increased rapidly to an estimated 300 - 400 today. The estimated market for resellers in 1982 was around \$0.7 billion, with the remaining \$2.3 billion of long-distance revenue captured by discounters was attributed to other common carriers, (OCCs). (22)

Our own interviews suggest that any estimates of resellers' revenues are subject to potentially significant error, since there are no precise statistics on how much resold traffic is carried by Other Common Carriers (OCCs). Furthermore, many resellers are second source resellers. That is, they are reselling capacity that was already resold by other carriers. Hence, there is a real danger of double and triple counting. (23) Since reselling is largely an unregulated activity in the U.S., no government or private sector agency has a compelling need to maintain a data base on resale activity.

G&G argue that entry into long distance resale was limited principally by inexperienced and undercapitalized management. Technical expertise was no barrier. There was apparently a fairly high failure rate in the early stages of the reselling activity. However, problems of undercapitalization and lack of expertise seem to be much less of an issue at the present time. Further, many existing resellers are relatively small companies. However, there is a trend toward resellers moving to facilities-based operations through acquisition/merger or through investment. (24) In particular, increased access charges have made "pure" reselling, especially on a small scale, increasingly uneconomical. Hence, there may be a further "shaking-out" of small resellers in the future.

The bulk of resellers are positioned in the business market with some residential traffic. Resellers tend to appeal to small and medium-sized businesses with long distance calls in the range of \$200 - 2000 per month. The average commercial revenue per customer is \$200 - 500 per month, while residential customers provide \$25 - 100 per month. (25) G&G found very little activity in private line resale. They found some smaller companies banding together in sharing partnerships to obtain price concessions from existing long distance suppliers. There is also evidence of "local bypass" functioning as an integral part of reselling. For example, real estate developers, and other third parties, provide PABX service for tenants. By leasing space, tenants can take

advantage of reduce long distance charges and other services.

The demand for resale services is based on two main factors: savings in long distance telephone charges and increased service offerings of resellers. G&G conclude that, to date, the main impetus has been the saving of 20 percent or more on Direct Distance Dialling (DDD). This saving has attracted certain categories of subscribers not large enough to justify taking bulk facilities but large enough to benefit from discounters' offerings of MTS services (26) According to G&G, the set of potential beneficiaries from reselling is limited to business subscribers and to intensive residential long distance callers. However, a recent study finds that a number of discounters are dropping their monthly fees and other restrictions, such as minimum dollar volume of calls per month. As a result, the "break-even" rate of discount calling is dropping for most residential subscribers. (27)

A second source of demand are the service offerings of resellers. One advantage enjoyed by resellers is that they have multiple lines available to a customer, whereas when a business obtains a WATS line, only one person at a time can use it. Resellers are also reputed to provide superior call accounting to that provided by AT&T. The service offerings of resellers are now extending into value added services such as teleconferencing, telephone answering, voice mailbox, call forwarding, and so forth. While at present, the main function of resellers may still be the arbitraging of differences between bulk rates and individual service rates, value added services may become the major competitive lever used by resellers in the future.

Indeed, our interviews with several U.S. resellers suggested that price differentials are becoming a progressively less important force underlying the reselling activity. One reseller (Lexitel) indicated a view that (up until recently) resale competition has been as much as 98% based on price. But increasingly, resellers have implemented specialized services - such as special billing procedures and call detail recording. Competition also encompasses financing terms, payments scheduling, and so forth. Rate structure differences, including special discounts, and specialized tariffs, also appear to be important competitive features of the reselling environment.

The evidence from the U.S. experience supports the hypothesis that resale has substantially reduced barriers to entry into the industry, including facilities based competition. Resellers can enter the industry by signing long-term leases on existing (or new) capacity to "lock-in" costs without large up-front financing requirements. By essentially pre-selling capacity, railroads and other owners of rights-of-way can plan installations of new fiber optics networks with greater certainty about future cash flows attached to their investments. In effect, reselling facilitates a form of "quasi" vertical integration, in which technical expertise, financing capacity and ownership of rights-of-way can be brought together in a long-term, institutional relationship. Furthermore, the argument can be made that the installation of new transmission networks is lowering the industry's overall cost structure.

To the best of our knowledge, there are no studies documenting the impact of reselling per se on total industry revenues, or on AT&T's revenues. However, it was indicated to us in interviews that demand for bulk service has increased faster than demand for MTS. (28) This result is consistent with an hypothesis that resale has significantly stimulated demand for bulk service, since common carrier bulk rates have risen relative to MTS rates. Given an increase in the relative price of bulk services provided by common carriers, one would expect the demand for bulk services to decline relative to the demand for MTS service on the final user level. The relative increase in demand for bulk service is therefore consistent with an hypothesis that there is relatively more demand for bulk services to provide resold services to final users.

While the claim is made that reselling has opened up the market for telecommunications equipment, thereby stimulating innovation, there is again little direct evidence documenting this assertion. (29) Hence, there is no direct evidence we can point to that supports this specific claimed efficiency benefit of resale and sharing. On the other hand, there is substantial (albeit largely impressionistic) evidence that the reselling market operates fairly efficiently. Specifically, an increasing number of companies (especially interconnect companies) have entered the market to act as brokers for resellers, and to fill information voids. For example, consultants do cost comparisons between telcos and advise clients on how to lower their phone bills. While

initially these consulting services were available only to large companies, smaller businesses and even residential subscribers are increasingly able to take advantage of these advisory services. Thus, there is evidence that one claimed disadvantage of liberalized resale and sharing, i.e. "confusion" in the marketplace, is probably not of particular relevance.

One point that has been well established in our interviews with U.S. resellers is that, once reselling and sharing restrictions are liberalized, distinctions between common carriers, resellers and sharers will begin to blur. Indeed, U.S. observers argue that, in the near future, all carriers - including AT&T - will have resale subsidiaries or divisions. Furthermore, sharing and reselling will start to merge inextricably. Consider as an example the Fibertrack network. Fibertrack is a fiber optics network under construction by several midwestern railroads. The railroads, in turn, have preleased capacity to Lexitel and a number of other resellers who plan to share the Fibertrack cables. The point here is that with the growth of reselling and sharing activities, fine regulatory distinctions will be all but impossible to make. Hence, efforts to regulate tariffs set by resellers, or to impose differential access charges based upon the nature of the sharing or reselling activity could be prohibitively costly.

INTERVIEWS WITH POTENTIAL CANADIAN PARTICIPANTS

Introduction

To obtain additional insight into the likely impacts of liberalizing resale and sharing restrictions in Canada, we undertook a set of personal, telephone and mail interviews with various potential participants on both the supply and demand sides of the relevant markets. Initially, a set of preliminary personal interviews was undertaken with a number of actual resellers (in the United States), several potential suppliers of telecommunications services in Canada and a few potential users of resold (or shared) services.

The main purpose of the preliminary set of interviews was to clarify the major factors on the supply and demand sides of the market for resold and shared telephone services and to obtain some preliminary indication of the perceived importance of these factors on the part of market participants. In addition, the interviews were intended to identify any relevant research work ongoing in this area that we were unaware of. Our interviews with Canadian firms, focussed particularly upon their potential interest in either supplying resold services or buying such services. In this context, we sought participants' opinions on the key characteristics of this market as they see it emerging.

Preliminary Interview Results With Canadian Firms

Our preliminary interviews with Canadian firms indicated that participants on both the demand and supply sides of the market view the main benefits of resale initially in the arbitraging of differences between bulk rates (including WATS) and DDD rates. However, they also emphasized the potential for adding value to basic transmission services in both the interexchange and intraexchange sectors, and for both voice and (especially) data services.

While not (strictly speaking) a value added service, another potential benefit of resale that was mentioned (outside of arbitrage) is the potential for flexibility in rate design. This added flexibility could include lower minimum block rates of usage in both bulk and message toll services; for example, where a subscriber to a WATS service may be required to buy a minimum of X hours of WATS time, a reseller might buy the minimum

block of hours and "parcel up" its use among a number of subscribers - each taking less than the minimum block of hours. As another example, where an existing carrier meters calls in y second (or minute) intervals, a reseller might implement a finer scale - such is metering in 20 second intervals rather than 60 second intervals. The social advantages of such rate flexibility can be quite substantial, in that it could facilitate a closer convergence between the marginal cost of providing a service and the price charged for that service. In some circumstances, increasing the divisibility of the rate structure might be seen as a form of arbitrage, especially when such increased divisibility leads to a closer convergence between the prices and marginal costs of difference services. However, in some cases, increased divisibility may simply add new options to the array of competitively priced options already available to consumers. Other things constant, consumer welfare would be improved by such increased choice.

The prospect was also raised that a liberalization of the resale and sharing environment would encourage entry into the telecommunications industry in a variety of different forms. For example, interconnect companies might act as "facilities managers" for a group of users sharing INWATS/OUTWATS lines through a common PBX. The greater number of participants, in turn, could well encourage a faster rate of introduction of new technology into the industry. The latter possibility reflects a plausible assertion that superior technologies are more likely to be identified and implemented, the greater the number of participants in an industry.

The Dynamics of Reselling and Sharing: Their Policy Relevance

On the surface, it may not seem particularly useful to identify specific motives for reselling and sharing, since under current federal (i.e. CRTC) regulations, reselling is legal when it involves the provision of enhanced services. However, this caveat ignores several considerations that make current regulatory policy potentially unsatisfactory. These considerations focus attention on the underlying demand-side incentives for reselling and sharing activities.

One consideration is that ambiguity about the legality of specific competitive actions may act as a barrier to resale and sharing, even when the relevant

activities involve the provision of enhanced services. For example, there is apparently a great deal of uncertainty about the legality of attaching customer provided equipment which performs inter-company data switching. For many enhanced services, such a capability is essential. (30) In a related vein, the use of shared PBXs by multiple subscribers is clearly prohibited to the extent that it facilitates the sharing of basic interexchange services; however, this restriction could be inhibiting the introduction of certain enhanced services that are tied to the PBX technology, such as detailed call recording.

The point to be made here is that with the elimination of restrictions on resale and sharing (for either basic or enhanced services) there would be no intended (or unintended) barriers to the introduction of efficiency-improving network service features owing to the aforementioned ambiguities. To be sure, eliminating all restrictions on reselling and sharing would also increase the risk that specialized carriers will wind up providing services that could be provided more efficiently by established common carriers, especially if elimination of restrictions preceded rate rebalancing. In effect, the policymaker is balancing risks associated with two types of error: either overestimating or underestimating the importance of price arbitrage as a driving force underlying markets for reselling and sharing.

Our own interviews underscored the differences of opinions held by various market participants regarding what constitutes an enhanced service. For example, representatives of several interconnect companies and firms currently involved in reselling basic telephone service indicated their belief that detailed billing (i.e. billing to specific accounts) and automatic time and charges constituted enhanced services. Usage-oriented charging for private line service, instead of charging a flat rate, was also cited to us as a legitimate enhanced service. Conversely, telephone company representatives we spoke to argued that these were not legitimate enhanced services, although they did not deny that these services would improve subscriber welfare. It is relevant to note that this ambiguity also exists in the Telex sector. Specifically, CNCP argues that a telex secretarial service does not provide enhancement, while telex resellers argue that by providing a telex/telephone interface, they are providing enhancement.

It is qualitatively clear that this ambiguity (on the margin) is retarding the introduction and diffusion of enhanced services; however, the quantitative significance of this delay relative to the risks of encouraging uneconomic competition is unclear. One objective of our survey work is to gain some insight into the nature of this policy trade-off by establishing the underlying motives for reselling and sharing.

SURVEY - OVERVIEW

Introduction

In this section, we review the main findings of our structured telephone survey interviews of potential participants on the supply and demand sides of the market for resold telephone services. Following our preliminary survey interviews, a unified questionnaire was prepared and subsequently employed in our structured interviews. A single questionnaire instrument was used, since it is entirely plausible (and based on U.S. experience even likely) that a number of respondents are potential participants on both sides of the market.

Profile of the Respondents

In choosing a sample of firms to interview, we attempted to realize a broad coverage of Canada's industrial sector. At the same time, given the limited number of interviews we had planned to conduct, we sought to identify firms that, on a priori grounds, were likely to have both an interest in and some knowledge of the reselling phenomenon. As a result, the sample is not necessarily representative of the general population of business subscribers in Canada; however, as Table One suggests, our respondents cover a broad segment of Canadian industry. (31)

In total, 20 organizations responded to the questionnaire reproduced in Appendix B.

Table One
Sectoral Distribution of Respondents to Our Structured Survey

<u>Sector</u>	<u>Number of Respondents</u>
Communications (interconnector)	1
Oil and Gas	1
Pulp and Paper	1
Steel	1
Transportation	2
Retailing	1
Office Equipment/ data processing	2
Financial Services	3
Hospitality	1
Public Administration	2
Other Services	3
Government	2
Total	20

The above-average size of our respondents is indicated by the substantial total average annual phone bill-equal to \$13.38 million - estimated for a subsample of organizations that were able and/or willing to provide us with figures for their telephone expenditures. It should be noted, however, that the telephone expenditures of the Ontario and Federal governments are substantially above the average for the rest of the sample. Indeed, when the governments are excluded from the sample, the average annual phone bill decreases to around \$800,000. Of this total, the bulk (around 80%) was associated with voice service, although there is a great deal of variance around this average. Further, almost 50% of the average reported phone bill was for long distance services. A majority of the respondents were unable to identify the proportion of their long-distance telephone expenses associated with bulk rate versus DDD service.

SURVEY RESULTS

The Potential Dynamics of the Resale Market

The survey questions most directly related to potential market developments in the event that all restrictions on reselling and sharing were eliminated concern our respondents interest in participating in the market (on either the supply or demand side) and their motives for participating. With respect to interest in reselling and sharing, almost 65% of the sample indicated an interest in sharing bulk facilities or using the services of a reseller. (32) The manufacturing and resource companies in the sample emphasized their interest in sharing facilities, especially the excess capacity they enjoy in non-business hours. This response is quite similar to responses we obtained in personal interviews. For example, MacMillan Bloedel indicated their interest in sharing their T-1 private line capacity with other pulp and paper companies. Imperial Oil informed us of their interest in sharing the downlink portion of their satellite network with other oil companies engaged in frontier exploration. (33)

Several companies indicated that their reservations about sharing capacity relate to concerns about maintaining security on the network and preserving the quality of their own transmissions. (34) It seems possible to argue that if these concerns about security and transmission quality were allayed, the number of companies interested in sharing capacity would increase significantly.

The nature of our sample, that is, a preponderance of larger companies undoubtedly accounts for the the substantial interest expressed in sharing bulk facilities and the somewhat understated interest in buying discounted DDD services from a reseller. Also, the pattern of responses might reflect respondents' difficulty in conjecturing a substantially different configuration of their networks. However, the strong expression of interest in sharing suggests that there is a significant potential in Canada to arbitrage price differentials between bulk service offerings. This interest belies somewhat the perception held by many industry participants that resellers (or sharers) dealing only with private line would not be very successful, since subscribers want access to a large number of telephones. (35) Apparently, a substantial percentage

of larger subscribers are receptive to sharing bulk facilities for both long-distance and local traffic. (36)

Potential Resellers

About half of the respondents to our structured surveys indicated an interest in becoming resellers. For the most part, these organizations are similar to those companies in the U.S. that have become actively involved as resellers or as specialized common carriers. (37) The most typical reason given for a reluctance to engage actively in reselling was that "the company is not in the telecommunications business." This response-- while understandable-- might also reflect an underestimation of the profitability of engaging in reselling. With regard to the latter point, there was some amount of disagreement among respondents regarding the potential profitability of reselling. Several respondents indicated that the opportunity to engage in profitable reselling is restricted by the fact that DDD calling between the hours of 6 P.M. and 8 A.M. is cheaper than WATS service. But the existence of excess capacity during off-peak hours was the most typical motive for becoming a reseller cited by our respondents. On the other hand, several other respondents stressed that high-volume reselling operations are potentially profitable, as well as reselling data lines, even given current rate structures. The most enthusiastic respondents stressed a wide range of reselling opportunities, especially on the data side.

With respect to the prospective dynamics of the resale market, our survey results suggest that substantial reselling and sharing activities can be anticipated following the liberalization of restrictions on those activities. The indicated interest in sharing bulk facilities is somewhat greater than we would have anticipated from the U.S. experience, or from the findings of the Goss, Gilroy study. It is possible, of course, that more interest in reselling bulk capacity would have been indicated had our respondents been more knowledgeable about the U.S. experience. Indeed, less than 40% of respondents to our structured survey indicated that they were more than vaguely familiar with the U.S. reselling/sharing experience.

Market Potential and Pricing Structure

The pricing relationship between various classes of service also undoubtedly accounts for the observed pattern of responses. For example, Table 2 shows price relationships between DDD and WATS service reported by BC Tel., which is representative of relationships across the country. The price of WATS 10 (i.e. 10 hours of minimum usage per month) is 80% of the cost of a comparable volume of traffic at DDD rates. The price of WATS 160 is about 60% of corresponding DDD rates; with overtime discounts, the price of WATS 160 service can go down to 40% to 50% of DDD prices. With discounts available on the large volume service, BC Tel believes that the WATS 160 service would be quite viable for resellers to purchase and-- in turn-- resell DDD service. At present, very few business subscribers can justify the WATS 160 service. But were reselling restrictions eliminated, hotels, retailers and other resellers easily able to "agglomerate" DDD traffic would (in the absence of rate rebalancing) find the service profitable for high volume routes. BC Tel's argument, in this regard, is consistent with the perception of our retail and hotel respondents that it is currently profitable to buy large volume WATS service and resell it as DDD service.

Table Two

Price Relatives Reported by BC Tel

WATS 10	80% OF DDD
WATS 160	60% OF DDD
COST OF DDD	36% OF PRICE

Source: Interview with Gordon Cameron of BC Tel

The pricing structure for TELPAK (dedicated lines between 2 cities) clearly shows the opportunity for cost savings through sharing capacity. The comparison in Table 3 shows the relationship between three TELPAK offerings compared to the cost of a Foreign Exchange (FX) line. One FX line is the simplest private line-equivalent in price to about 25 hours of DDD.

Table Three
Rate Relationship for Private Lines

TELPAK A (12 lines) about 15% less than FX per line
TELPAK B (24 lines) about 25% less than FX per line
TELPAK C (60 lines) about 50% less than FX per line

Source: Interview with Gordon Cameron of BC Tel

The relationships in Table Three underscore incentives to share private line capacity among firms calling down a common route. But obviously this activity will have a relatively limited impact on most residential and small business subscribers, since the latter want access to a large number of telephones. This point is reinforced by data in Table 4, which show BC Tel's business long-distance traffic by major service offering. Total private line traffic is less than 10 percent of all business long-distance traffic.

Table Four
BC Tel--Originated Business Long-Distance Traffic
Total Revenues

MTS \$250M
WATS 50M
TELPAK 8-10M
Other private line . 20-25M

Source: Interview with Gordon Cameron of BC Tel

Of course, were sharing of basic private line services legal, the foregoing revenue distribution would be less skewed toward MTS. The extent of migration from MTS and WATS to private line services will depend upon various considerations mentioned above, including potential cost savings and concerns about privacy. As local bypass becomes increasingly feasible, this migration would presumably accelerate.

Motives for Resale and Sharing

As noted in an earlier section, to the extent that the migration of traffic from MTS service to bulk services is largely motivated by the "artificial" long-distance rate structure, the economic arguments for liberalizing reselling and sharing, especially in the

absence of rate rebalancing, are less than compelling. Our survey tried to get a "feel" for how much resale and sharing activity would be motivated by price arbitrage considerations and how much would be motivated by opportunities for "adding value" to the basic transmission service.

Specifically, our respondents were asked to identify the factors in the environment that contribute most significantly to profitable opportunities for reselling and sharing. Before reviewing the reported results, it is worth pointing out that the question may have demanded a greater knowledge of the reselling and sharing phenomenon than many of our respondents possessed. As noted above, less than 40% of the respondents to our structured survey were more than vaguely familiar with reselling and sharing developments in the U.S.

Our results can be summarized by noting that respondents gave about equal weight to the "price arbitrage" and "value added" motives for reselling and sharing. As suggested above, a number of firms emphasizing cost savings as a motive stressed the advantages of sharing bulk facilities. Others emphasized the opportunity to "migrate" MTS traffic to bulk rate offerings through a shared PBX arrangement in office and apartment buildings.

Respondents suggested a number of specific reselling opportunities tied to "adding value" to the basic transmission service. One broad area involves data services, including the interconnection of voice and data facilities, encrypting voice and data, and credit checking. Others are related to broadband services such as teleconferencing and electronic mailboxes. To be sure, common carriers will argue that they are currently able to offer many of these services. But the main point is that subscribers are-- at least in principle-- sensitive to new service offerings. It is also interesting that about half of the respondents who had previously indicated an interest in becoming resellers stated their belief that the major competitive opportunities lay in offering value added services.

One point upon which there was virtually unanimous agreement was the comparative unimportance of opportunities to provide customized billing and pricing techniques for specialized groups of customers. The main reason is that the PBXs currently used by most of our respondents have the capacity to do call detail recording

and other billing algorithms. However, it is again relevant to stress that a sample that included smaller firms might attach a greater significance to this competitive feature. It is also worth stressing that it is extremely difficult to anticipate the kinds of enhanced services that might be introduced through reseller competition. But it is precisely this uncertainty that creates market opportunities for specialized resellers and carriers to match the network needs of specific subscribers to the emerging technology.

As a further insight into the perceived motives for resale and sharing, the answers to the last question in our survey is relevant. It asks the respondents to indicate the main hoped-for benefits of increased competition. Over 70% of the replies to this question indicated that the main hoped-for benefit was "lower costs." This response suggests to us that (at least in the short run) successful resellers will look to arbitrage opportunities primarily as a way to build traffic. (38)

Responses of Regulated Carriers

Given the policy importance of the motives for reselling and sharing, our interviews with a sample of common carriers focussed heavily on this issue. (39) The telcos stressed that the most likely form of resale would entail the resale of WATS as MTS. But the sharing of private line service is also considered to be a potentially significant activity. CNCP also affirmed that sharing of Telpak bulk facilities and the resale of WATS as MTS are likely to be major outcomes of a liberalization of reselling and sharing restrictions. (40) The telcos see interconnect companies, hotels, large retailers and developers as most likely to enter the market as facilities-based resellers. That is, most are likely to enter the market as specialized common carriers -- either by building their own facilities or by taking long-term leases. (41) On the other hand, CNCP believes that small, newly created or franchised companies specifically formed to provide resale services -- comparable to Longnet or Cam Net -- could be expected. (42)

While price arbitrage is currently seen as the main motive for reselling and sharing, the potential for adding value is acknowledged. Types of enhanced services cited include store and forward messaging, call

forwarding, time delivery systems, facsimile and electronic mail. The potential also exists for introducing specialized services on the data side.

Telco respondents tended to agree with a number of other observers that economic and technological changes are expanding the opportunities to offer specialized enhanced services. As the OECD notes: demand for services such as data transmission, facsimile, video-conferencing-- and all the combinations thereof-- generally varies much more greatly over the population than does demand for basic telephony. (43) In addition, the emergence of broad-band capacity associated with fiber-optics and satellite networks opens up the possibility of offering new services such as automated shopping and banking, applications of videotex and so forth.

A number of interviewees stressed that shared networks would facilitate better matching of network features to consumer needs, along with a more rapid introduction of new technology. This is the position of the Canadian Bankers Association (CBA), for example, in respect of the use of a shared fiber optics network for Point-of-sales systems. (44) While our telco respondents might not agree with the specific assertions of groups such as the CBA, they did indicate agreement with the argument that some enhanced services will be provided on a specialized basis and that telcos may not offer them, or that these specialized services would come faster with resale. In sum, there is some agreement that, over time, the major focus of reselling competition will likely shift from price arbitrage to specialized service offerings.

Resale Competition and Interexchange Competition

Several respondents stressed that the nature and impacts of resale competition will depend upon whether or not there is also interexchange competition. The relationship, however, is not completely clear-cut. One deduction is that interexchange competition would largely eliminate the arbitrage opportunities between bulk services and MTS. This point is underscored in Bell Canada's observation that even if CNCP's push for interexchange competition is rejected, "a large service provider, possibly a CNCP subsidiary, could lease CNCP bulk facilities and interconnect them to Bell's local access facilities through its own switches to potentially

provide all types of service that a service provider would be capable of providing in direct market entry scenarios." (45)

The nature of resale competition might be affected in other ways by policies toward interexchange competition. A major concern in this regard is that if Telecom Canada maintains its regulated monopoly position in the long distance sector, it will restrict the access that potential resellers have to the network. More specifically, it would presumably restrict reselling that was not complementary to its basic telephone services. Even if CNCP is approved to offer basic interexchange service, potential problems of foreclosed access to the network would persist, although the potential for WATS-type service competition would be enhanced. In the scenario where only Telecom Canada and (possibly) CNCP offered switched long-haul voice service, major Canadian resellers would be more likely to use facilities of U.S.-based carriers than they would be if there were more extensive domestic competition in the provision of basic long-distance service.

There are several Canadian resellers currently offering discounted long-distance service to the United States. But of more concern is the possibility that resellers will begin to offer discount services that originate and terminate in Canada. Indeed, we were informed in our interviews of a company in Vancouver that advertises it will take traffic from Vancouver to Toronto and Montreal through the U.S., and as long-distance rates in the U.S. continue to decline relative to Canadian rates, it is increasingly likely that cross-border resellers will begin to originate traffic from central Canada. While the operations of cross-border resellers can be interrupted (at a cost), persistent "hit-and-run" entry might be anticipated as long as wide price-cost margins exist for MTS traffic. In short, the social welfare gains from liberalizing restrictions on resale and sharing are likely to be maximized when such liberalization is accompanied by broad interexchange competition. This is especially true given the pattern evidenced in the U.S., where entry of resellers has recently been facilitated by new investments in fiber-optics cable.

SUMMARY OF SURVEY RESULTS

We would summarize our survey results by noting that there is fairly broad agreement between the findings from our closed-end questionnaire and those from our open-ended interviews. In particular, while price arbitraging is a relevant motive for prospective reselling activity, direct cost sharing of private lines is also a potentially important driving force in the marketplace. The provision of enhanced network services is also a potentially important competitive motive in the resale market. Our survey results, as well as other contributions to the literature, suggest that specialized enhanced services will become an increasingly important feature of network competition in the future.

Our closed-end survey results offer the suggestive finding that specialized billing and tariffing procedures, which are not clearly enhanced services under existing regulations, may not be important competitive features in the medium-to-large subscriber market. However, they may still be quite important for smaller subscribers who cannot afford the terminal equipment necessary to provide these services in-house. At the same time, as network software becomes increasingly sophisticated, more and more value-added services may be offered as part of a package of "basic" network services. The point here is that the ambiguous distinction between basic and enhanced services will continue to be a barrier to the faster introduction of new network services.

A further illustration of the ambiguous distinction between basic and enhanced services is provided in the case of banking networks. For example, the Canadian Bankers Association is unsure if a shared Point-of-Sale network would be considered a basic or enhanced service, especially since excess capacity on POS networks can be used for a variety of other services, including voice and data transfer. (46)

Revenue Implications of Resale and Sharing

A handful of respondents to our structured questionnaire indicated a belief that the overall revenues of common carriers would increase with a liberalization of restrictions on resale and sharing, a point disputed by the telcos. As noted earlier, the relevant point in this context is whether resale and sharing will reduce revenues available to cross-subsidize

local subscriber costs.

Unfortunately, it is impossible to be at all definitive about the revenue impacts of resale and sharing competition. This point can be illustrated by equation one which describes the determinants of the profitability of telco long-distance services:

$$1. \quad \Pi = P_b Q_b + P_r Q_r - C_b Q_b - C_r Q_r$$

where Π = telco profit on long-distance services; P_b = the average price of bulk services (e.g. Telpak and WATS); Q_b is the quantity of bulk services produced and sold in the market place; P_r is the average price of "retail" telephone services, (e.g. MTS); Q_r is the quantity of retail services produced and sold in the market place; C_b is the average cost of bulk services; and C_r is the average cost of retail services.

The Effects of Liberalizing Sharing

The effect of liberalizing sharing would presumably be to reduce the implicit average price of large volume bulk services faced by subscribers. That is, many subscribers could drop higher (on average) priced Telpak and WATS services and acquire a portion of lower (on average) effectively priced bulk services. All other things constant, this implicit price reduction should encourage an increase in the total volume of bulk services utilized, with a reduction in the average (effective) price paid for bulk services. In effect, we are arguing that sharing will lead to a more intensive utilization of bulk capacity. However, since the resulting cost savings are captured by the sharers of the bulk service purchased, total revenue to common carriers from the sale of bulk service would decline, as more efficient use is made of bulk facilities by subscribers. This analysis presumes that common carriers do not change the explicit prices charged for bulk services. (47)

As CNCP notes, however, if the telcos change their tariffs for bulk services, the revenue impacts become less clear. For example, if the average price of large volume Telpak and WATS services is increased, total revenue associated with a migration from lower to higher volume bulk services might well increase. Presuming that the access costs associated with reconfiguring bulk services are covered in charges to subscribers, any increases in (C_b) will be mirrored by offsetting changes

in Pb. If cost changes to the telcos are not full recovered by access charges, the profitability of within-bulk service migration would be put under additional downward pressure.

The Effects of Liberalizing Resale

The effect of liberalizing reselling is somewhat more complicated to analyze. All other things constant, there would presumably be a migration of traffic from Qr to Qb. Given that the price-cost markup for Qr is higher than for Qb, that is $(Pr-Cr) > (Pb-Cb)$, this migration would lead to a reduction in telco profitability, all other things constant.

Complications arise because it is extremely unlikely that all other things will remain constant. For example, if resellers are successful in introducing new services and (thereby) in stimulating network traffic, the volume of bulk services sold by the telcos might increase as a derived demand for new (as opposed to simply migrated) retail services. This, in turn, would contribute to increased profitability for the telcos.

It is also likely that relative price changes will take place. Specifically, bulk rate prices will probably increase relative to retail prices. By itself, this would reduce the net revenue loss to telcos associated with a migration of retail business to the wholesale level. However, unless new retail business is created that ultimately manifests itself in an increased demand for bulk services, it is difficult to imagine telcos actually realizing an increase in long-distance profits associated with increases in wholesale rates relative to retail rates. Certainly, new retail business will be created by absolute reductions in MTS tariffs, and this new business should lead resellers to demand increased bulk facilities. But since most estimates show the price elasticity of demand for MTS to be less than one, (48) it is extremely unlikely that any increase in traffic resulting from lower average retail prices would offset the telcos loss of revenues from lower average prices on MTS traffic that remains on the telco's network. This adverse revenue impact would be exacerbated if the additional traffic created at the retail level imposed costs on telcos that were not fully recovered in bulk tariffs.

In summary, unless the activities of resellers

create a strong increase in Q_r that directly or indirectly creates a strong increase in Q_b , it is difficult (but certainly not impossible) to make an argument that the toll revenues of telcos would increase as a result of liberalized reselling and sharing. The concern that arises in this respect is that profits in the long-haul segment of the business that are used to subsidize the local segment may be dissipated, forcing policy-makers to endorse a rate rebalancing scheme before they are prepared to do so - or in a form that is not "optimal".

To be sure, policy makers might impose an access "surcharge" on resellers to capture some of the long-distance revenues that are lost by the telcos associated with "migrated" retail traffic. But there are several relevant caveats here. One is that overall long-distance revenues might actually decline (at least in the short run) given a decline in P_r associated with reselling activity. This result is suggested by the inelastic overall demand for long-distance service. Second, it may be difficult to recapture the migrated revenues even in the long-run given the growing potential for bypass, including cross-border bypass. Of course, bypass remains a threat even in the absence of legalized reselling, as long as rate structures are inconsistent with the respective costs of providing services. The point here is that the issue of rate rebalancing is logically addressed before rather than after the issue of whether major changes should be made to the regulated structure of the industry.

Given the importance of the issues surrounding the resale and sharing phenomenon, and the limitations on addressing these issues either through surveys or theoretical analysis, we decided to look at the experience of other segments of the industry where competitive conditions were liberalized.

EVIDENCE FROM THE INTERCONNECT INDUSTRY

Introduction

The debate surrounding the liberalization of restrictions on terminal attachment encompassed a number of arguments that characterize positions taken on the issue of liberalizing restrictions on resale and sharing. In particular, opponents of terminal attachment argued that it would seriously erode the capacity of common carriers to subsidize local subscribers. It was also argued that terminal attachment would lead to a degradation of the network, and that the benefits of competition would largely take the form of product differentiation. On the other hand, proponents of terminal attachment competition argued that it would lead to lower prices for such equipment, as well as a faster introduction of new technology.

The interconnect experience also potentially offers some insight into another relevant issue. Namely, is there any strong reason to believe that entry into the industry will be "excessive", in that a significant percentage of entrants will be unqualified or undercapitalized? The issue is relevant in as much as it would constitute a "transaction cost" to set against the potential benefits of liberalized competition. The interconnect experience also offers some evidence on the extent to which the benefits of competition are diffused throughout the population of telephone subscribers.

The U.S. Experience

The experience of U.S. subscribers with terminal attachment competition is a relatively long one, dating from the late 1960's. One comprehensive description of early market developments in the U.S. interconnect industry is provided in Brock. (49) His main findings are summarized in Table 5:

Table Five

Bell System and Competitive PBX and KTS Systems

Year	Bell PBX and KTS (\$millions)	Interconnect PBX & KTS (\$millions)	Interconnect Share (%)
1969	\$1,486.	0.4	.03
1970	\$1,644.	5.7	.40
1971	\$1,775.	18.0	1.00
1972	\$2,015.	38.9	1.90
1973	\$2,227.	67.6	3.70
1974	\$2,532	96.7	3.70

Source: Gerald Brock, *The Telecommunications Industry: The Dynamics of Market Structure*, Cambridge, Mass: Harvard University Press, 1981, p.244

Competitive terminal equipment was introduced in 1968/69. By the end of 1974, the U.S. interconnect industry was made up of hundreds of firms providing a variety of equipment, and by 1984, there were over 3500 interconnect companies in the U.S., along with over 100 equipment manufacturers. Brock argues that the advent of competition did not reduce AT&T's revenues from PBX-KTS Systems or even reduce the historical growth rate of those revenues. In the 5 years preceding competition, AT&T's PBX-KTS revenues grew at a compounded growth rate of 10.7% per year. The overall market (in Bell territories) increased at an 11.4% compounded rate during the first 5 years of competition. (50)

Brock argues that the PBX-KTS overall market size was increased after competition through price reductions and the introduction of new products. New products incorporating greater use of electronics technology and improved convenience features were particularly significant in stimulating demand. By the end of 1973, customers had a choice of 39 KTS systems manufactured by 15 different companies. The choice in PBX systems was even wider with 163 models available from 28 different manufacturers. Nor were the product introductions all "cosmetic". A partial list of new products and services introduced by interconnect companies includes modems, teleprinters, CRT display terminals, remote batch terminals, point of sale terminals, banking terminals, credit card authorization systems, telephone and

recording systems, call dispatchers and toll restrictors. (51) Innovational activity in the interconnect industry has been reflected in specialized features, improved equipment performance, new and more efficient manufacturing processes and lease and purchase options more closely tailored to customer requirements. (52)

Observers also suggest that interconnect competition provided a significant stimulus to telephone company innovation and marketing of terminal equipment. Specifically, AT&T reorganized part of its development procedure in order to reduce the time between the design of new PBX equipment and actual delivery of the equipment to customers. The company's listing of its innovations was much greater than after the competitive era than before. (53)

Interconnect In Canada

For a variety of reasons, one must be careful in extrapolating too much from the U.S. interconnect experience. In particular, available studies are unable to identify how much the terminal equipment revenues of the common carriers would have grown in the absence of terminal attachment. It is relevant, however, that the early interconnect experience in Canada appears to be similar to the U.S. experience. Specifically, the terminal equipment profits of both Bell Canada and BC Tel have continued to increase, notwithstanding the entry of interconnect companies. Furthermore, by the end of 1983, interconnect companies' share of the total key telephone /PBX market in Canada was less than 9%. (54) To repeat, however, these foregoing observations do not gainsay the argument that terminal equipment revenues of the common carriers would have been even higher in the absence of interconnection. To our knowledge, no formal statistical analysis has been conducted of this "what if" question.

While there is a danger of extrapolating too much from the interconnect experience, it seems fairly clear that (based on that experience) restrictions on resale impose potential costs in the form of delays in the introduction of new equipment and new services. While new technology developed outside of Canada will be little influenced by competitive conditions within Canada, the application and diffusion of new technology by Canadian firms will be importantly influenced by domestic competitive conditions. At the same time, the interconnect experience makes clear that price

competition is an expected result of liberalizing reselling and sharing restrictions. The impact of such price competition on the ability of common carriers to maintain existing cross-subsidies in the telephone rate structure is a critical policy issue. On this subject, the interconnect experience may be misleading, especially given the relatively small cross-subsidy that (in any case) would have gone from equipment sales to local subscribers. Hence, the potential for revenue diversion away from the common carriers was of much less public policy relevance in the case of terminal attachment competition compared to liberalizing resale and sharing restrictions.

After suffering a significant erosion of market share, the telcos, in particular Bell Canada and BC Tel, became aggressive marketers, and segments of the industry - including the PBX segment - were marked by price wars. Over the period 1980-1983, vendors of terminal equipment believed that the most important consideration to customers when choosing a vendor or a system was price. (55) This is not to say that features were unimportant considerations to subscribers. Indeed, it was a petition by the Ontario Hospital Association to the CRTC that was instrumental in motivating an in-depth consideration of terminal attachment restrictions by the regulator. The OHA petition alleged that desired service and terminal equipment to meet their patient care requirements was readily available in the U.S. and was also produced by Bell Canada's manufacturing subsidiary in Canada, but was just not offered by Bell Canada. In some cases, features that could be provided on software controlled systems such as the SL-1 were not offered such as Call Detail Recording and Most Economical Route Selection. At the same time, electronic PBX systems offering these (and other) new features were rapidly accepted in the marketplace. As an illustration of this point, by mid 1981, there were well in excess of 100 suppliers of telephone equipment in Canada. (55a) There is evidence that non-price dimensions of competition are becoming increasingly important as time goes on. A number of interconnect company executives have noted that the trend is toward the integration of voice and data communications, and with it a trend toward greater specialization on the part of sales and service personnel. As a result, interconnect companies are becoming more familiar with the needs and problems of particular markets and will increasingly need to manifest expertise in developing innovative applications of terminal equipment. (56)

Several other observations from the interconnect experience may be less contentious than the preceding observations about the impact of competition on common carrier revenues. In particular, the U.S. evidence indicates that the performance of telephone company provided equipment is not qualitatively different from equipment supplied by interconnect companies. Furthermore, no persuasive evidence has been presented to support arguments that interconnection has resulted in network harm. As a further point, it would not appear that liberalizing terminal equipment interconnection encouraged the wholesale entry of inefficient competitors. To be sure, there has been some contraction in the number of interconnect companies in Canada. Specifically, early in 1982 there were 148 firms across Canada selling interconnect systems. As of spring 1983, there were approximately 110 interconnect firms operating in Canada. (57) A substantial portion of this decline is undoubtedly the result of the severe recession of 1982/83. Moreover, there is no evidence that the departure of interconnect companies left any customers without service or maintenance. Typically, the customer base of an existing company was assumed by the acquiring company or by some remaining competitor. In short, potentially adverse "externalities" associated with liberalized competition do not appear to characterize the interconnect activity.

Competition in the Telephone Directory Business

Another interesting and potentially relevant analogy to the reselling activity involves competition in the U.S. telephone directory business. In some states, telephone companies are required by law to sell up-to-date directory listings at a nominal price. The subsequent redistribution of these listings may be thought of as a form of resale. For example, one company - International Publishing Inc., which publishes directories in three rural areas near Eugene, Oregon - buys listings in the form of computer-generated copy from Pacific North-Western Bell (PNB) for 10 cents a piece. The company then sells ads at discounts of up to 78% from what PNB charges. In addition, the company offers advertisers larger type, a better grade of paper and full schedules of local sports teams in its book. (58)

The competition afforded by International Publishing Inc. is apparently quite representative of how small independent companies are operating in this sector. Besides offering lower prices, the independents emphasize more flexible payment terms, more colorful artwork, coupons and more help in developing ads. The regional Bell directory publishers are responding to this competition in a more entrepreneurial fashion. For example, they are publishing directories outside of their own service areas. They are also targetting directories to specific "vertical" markets. For example, Southwestern Bell publications has announced the Silver Pages, directories listing services, discounts and special offers to senior citizens. A division of Bell South is publishing a national directory of professional engineers. It has also announced that it will launch Industrial Pages, a directory tailored for purchasing agents and carrying listings for such items as gauges, acids and commercial paints. Other regional companies are producing directories of hotels and motels, restaurants and companies in the health care industry. (59)

As in the case of interconnection, liberalized competition in publishing directories has led to both price declines and a proliferation of new products and services. One must again be cautious in extrapolating this outcome to the liberalization of restrictions on reselling and sharing. However, the experience is suggestive of the kinds of benefits that might be expected from such liberalization.

Deregulation and the Transportation Sector

The experience of the rail and trucking industries under deregulation offers further insight into the potential impacts of a liberalized regime for resale and sharing. In particular, the deregulation of freight rates in the United States led to a substantial increase in the costs of shipping small freight loads. The volume discount structure therefore came more to resemble the relationship between bulk rates and MTS rates in the telephone industry.

The substantial change in relative transport rates has led to significant changes in freight transportation and distribution practices. In particular, it has led to freight consolidation, which may be likened to sharing of telephone circuits. It has also led to substantial

changes in the way in which transportation networks are configured. It is our assessment of the relevant literature, that the equivalent of resale and sharing activities in the transportation sector are motivated largely by price and cost considerations. At the same time, substantial efficiency improvements and new service offerings have resulted from the competition that has taken place.

In 1979 trailer-or-flat-car service (TOFC) was deregulated in the U.S. (60) The new regulatory environment has encouraged freight forwarders to make maximum usage of intermodal facilities-- that is, truck-piggyback traffic-- which was quite unbalanced before deregulation. In the early 1970's piggyback traffic moved east to west 100% loaded but the backhaul was only 30% loaded; piggyback movements are now almost balanced in both directions.

The increase in piggyback traffic resulted from aggressive backhaul pricing from the railroads and the fact that since 1980 forwarders have been permitted to enter into contracts with rail carriers. (61) Brokers and freight forwarders have been matching their traffic to empty backhauls in order to obtain more competitive rates.

A number of truck freight consolidation services appeared in the U.S. after 1980. These are aimed at the small shippers trying to avoid the high post truck -- deregulation costs of low volume, low weight and low frequency shipments to their customers. Less than truckload-LTL freight has increased in price in relation to truckload. This is comparable to the difference between bulk rates and MTS rates.

In some cases small shippers have worked together with other shippers that have their own private carriage operation, a situation which is quite analogous to sharing telephone lines.

Trucking deregulation resulted in general freight carriers responding to shippers' broader perspective on logistics costs by providing a full range of assembly and distribution services such as freight consolidation and local transportation.

POLICY ALTERNATIVES

In this section, we consider alternative policies toward resale and sharing. The major objective is to highlight the advantages and disadvantages of the various policy suggestions from a public policy perspective.

Permit Shared Use and Resale Without Restriction

Perhaps the most straightforward, if not the least contentious proposal is to permit shared use and resale without restriction. This proposal would encompass ignoring any distinctions between basic and enhanced services, and eschewing any direct or indirect regulation of resale carriers. It is, in effect, an aggressively market-oriented approach toward the issue of resale and sharing.

Objections to a completely liberalized approach toward reselling and sharing have been raised by a number of industry participants. Several were discussed in earlier sections of this paper. Perhaps the key objection is that unrestricted resale and sharing will lead to an erosion of the common carriers' revenue base through simple price arbitrage. Furthermore, there will be direct costs associated with such arbitrage, since resellers impose some costs on the network. There may also be indirect costs, to the extent that common carriers are more efficient at providing services in the long-run but are prevented from "fairly competing", having to charge "artificial" prices set by the regulator.

This point is essentially made in Telesat Canada's submission to the CRTC regarding Interexchange Competition. Telesat Canada notes that in an open-entry competitive environment with the burden of cross-subsidies removed, it would not object to resale. Should a policy on competition in the provision of telecommunications services require further liberalization of the resale of satellite service, the company would expect to be relieved of regulation of partial channel prices or resellers should have their prices for the same service regulated. (62) Telesat's concern arises with resellers being able to undercut Telesat's partial and occasional use rates on an unregulated basis and still have their revenues exceed their costs (as determined by them), since this will

result in a loss of potential revenues to Telesat. (63)

CNCP adds the objection that it would not be in the public interest for entrepreneurs to be lured by existing rate structures into the resale market, only to have the margins eliminated or reduced. The establishment of a resale market under "artificial" conditions would be unfair both to the resellers and to their subscribers, since the latter may be disadvantaged or inconvenienced if their communications services provider should cease to exist. (64) CNCP suggests that a more practical approach would be to provide the common carriers with an opportunity to make any adjustments to their tariffs which they may regard as necessary prior to the removal of the tariff prohibitions against resale and sharing. Such rate restructuring would enable potential resellers to judge the true market opportunities that exist and would prevent chaotic situations that could arise if artificial market conditions were to induce entry by resellers.

While we are in sympathy with concerns that simple price arbitrage may lead to added costs - with little benefit for consumers that could not be obtained by allowing common carriers greater flexibility in their pricing policies - we are not overly sympathetic to the argument that chaotic conditions would ensue from allowing resellers and brokers to enter the industry and then allowing common carriers to adjust their prices. The U.S. experience suggests that resale competitors have responded in an orderly manner to changes in access prices and to changes in the differential between bulk and MTS prices. (65) Furthermore, as discussed in an earlier section, there is no persuasive evidence that competition in the interconnect sector has been "chaotic".

Permit Shared Use and Resale With Restrictions

This alternative encompasses a number of potential approaches that try to capture the benefits of resale and sharing, while mitigating the major shortcomings. This set of approaches may be thought of as regulated competition.

In one suggested approach, both common carriers and resellers would be regulated. (66) Specifically, both groups would need permission to offer new services and to vary their prices. A key consideration with respect to

the first activity is the scope of competition that resellers would be allowed to engage in. In particular, should present restrictions be relaxed to permit resale and sharing of services which encompass any degree of enhancement whatsoever? (67) Alternatively, should restrictions be maintained to limit the provision of enhanced services to those where the enhancement is substantial?

Regulated competition would presumably provide the regulator with an opportunity to limit the amount of pure price arbitrage that takes place in the sector. This can be done by attempting to regulate the prices that resellers (or sharers) charge their final users. The idea would be to prevent resellers (or sharers) from passing on bulk decreases in the form of lower "retail" prices to an extent that the MTS traffic of common carriers would fall below some acceptable volume. Price arbitraging activity could also be controlled by the regulator insisting on a high threshold of enhancement to basic services if services are to be resold or shared.

In the best of all possible outcomes, resale and sharing competition would be channeled into activities which promoted lower real costs and the faster introduction of new products and services. With this outcome, policymakers could be reasonably sure that the overall social welfare effects of liberalized (albeit regulated) reselling and sharing were favourable. The problem is that regulated competition is unlikely to produce this happy result.

There are numerous grounds on which to suspect the viability, let alone the beneficence, of regulated competition. We have already noted the difficulties attached to determining the degree of enhancement associated with a given service. One expert has taken a very strong position against requiring that vendors "add value", suggesting that it would only lead to shams and/or litigation over what constituted sufficient or proper "added value". (68) He adds that a restriction of liberalization to data service only would be a short-sighted policy because of current technological trends: e.g. voice networks are tending towards digital transmission. (69)

One can also anticipate great difficulties associated with determining when lower rates charged by resellers are the result of improved efficiency, and when they are simply the manifestation of arbitrage between

bulk rates and MTS rates. It is difficult to imagine any regulator successfully tackling the job of identifying the underlying source of a price change. In any case, if suppliers know that their price restrictions will be reviewed for their "legitimacy", price rigidities will likely result. This, in turn, would be inconsistent with one basic purpose of liberalizing competition; i.e. bringing down telephone prices.

One expedient that the regulator might consider is retaining the prohibition on the resale of discounted services such as Telpak and WATS. This would certainly ease the burden of identifying when resale was based purely on price arbitrage. However, it would also involve foregone pressures to introduce new services and to price services at cost-based rates.

Comprehensive Restrictions Against Resale and Sharing

An extreme "regulatory" approach to the issue is to prohibit all reselling and sharing activity. This alternative is included purely for the sake of completeness, since it is likely that all industry participants - on both the supply and demand sides of the market - would suffer from such restrictions. In addition, one could expect the threat of cross-border reselling to become overwhelming in such a restricted environment. Given a strong policy commitment to national sovereignty in the telecommunications industry, it is difficult to see how the Canadian interest would be served by this policy.

CONCLUSIONS

In evaluating the various policy alternatives, the critical issue is how to proceed with liberalization of resale and sharing restrictions given the substantial cross-subsidies in the telephone pricing structure. In the absence of these cross-subsidies, the "first-best" solution would clearly be a full liberalization of resale and sharing restrictions. Furthermore, in a "rate-rebalanced" environment, there would be no reason to regulate resellers and sharers. (70) But, given the existence of substantial departures between the costs of providing different services and the prices charged, policies toward reselling and sharing must confront extant cross-subsidies in the telephone pricing structure.

In our opinion, it is impossible to be unequivocal about whether social welfare would be improved by liberalizing reselling and sharing restrictions prior to allowing common carriers to make adjustments to their tariffs to reflect the costs of providing different categories of service, including access. The preferred solution will clearly depend upon the weights that policymakers place on the risk of "uneconomic" entry versus the risk of a slower introduction and diffusion of new network services and products. The magnitude of these risks are virtually impossible to quantify with any precision. (71) Moreover, the net benefits of reselling and sharing will depend partly upon whether or not interexchange competition is permitted by the regulator. Our preceding analysis suggests that the social benefits of reselling and sharing would be promoted in an environment of interexchange competition.

While our assessment is ultimately a judgment call, we are of the opinion that the risks of "uneconomic" reselling and sharing are sufficient to mitigate against fully liberalizing restrictions on reselling and sharing prior to "rate rebalancing". We see rate rebalancing and interexchange competition as logical precedents to full liberalization. At the same time, we emphasize our concern that significant subscriber benefits may be foregone while the difficult issues associated with rate rebalancing and interexchange competition are resolved. In this regard, we would favour a policy which applied a weak test of what constituted sufficient enhancement for legal resale and sharing. To make the test operational, we suggest that a standard of "uniqueness" be applied. That is, if a service is provided (in conjunction with

basic communications) that is not provided by the common carrier, it would be considered sufficient enhancement to qualify the resale or sharing activity as legal. In this way, difficult judgements and market uncertainty about what constitutes enhancement would be minimized, although, to be sure, the criterion of uniqueness will also occasionally provoke disagreements and difficult judgments.

Obviously, the longer it takes to implement a cost-based pricing structure with interexchange competition, the greater the incentives for non-common carriers to introduce services which are only marginally different from basic communications services (by our uniqueness standard). Hence, we recommend that the "uniqueness" policy suggested above be subject to an automatic review at periodic intervals. If it is deemed that the primary impact of resale and sharing has been to arbitrage price differences, progressively stronger criteria for enhancement could be imposed, presuming that the price arbitrage taking place has had anti-social effects. (72) We recognize here the difficulties a regulator would face in requiring companies to retract services already offered. However, we would note that any change in the regulatory environment inflicts windfall gains and losses on firms, including those denied initial entry into the industry. Presumably, an efficient capital market would properly discount a company's expected earnings for the probability that the company will have to retract one or more services it offers. Hence, the magnitude of wealth changes associated with regulatory changes could be fairly modest.

It is worth considering briefly how our suggested policy approach compares with the CRTC's recent decision (Telecom Decision CRTC 84-18) regarding the provision of enhanced reselling services. The Commission decided that, while resale of all carrier services should be permitted for the provision of enhanced services, it should not be permitted where the enhanced service has as its primary function the provision of a basic service.

In our view, the qualification that a service be primarily enhanced perpetuates ambiguity, and will likely discourage the introduction of services related to new pricing techniques, billing procedures and the like. While our survey did not reveal a substantial unsatisfied demand for such services, we noted that our survey may be biased in its exclusion of small businesses and even residential subscribers. Our own preference therefore

remains to err on the side of a liberal resale policy. That is, to allow resale and sharing where there is any enhancement, in the form of a service not previously provided by a common carrier.

The CRTC decision also provides for a protest procedure. Specifically, should circumstances arise in which a carrier believes that the primary function of an enhanced service, the provision of which requires the resale or sharing of carrier services, is to provide a basic service, the carrier may apply to the Commission to deny resale or sharing for the purpose of providing the service. Our own preference is for an automatic review procedure at staged intervals. A potential difficulty with the procedure suggested by the CRTC is that the carriers may use the regulatory process to "harass" legitimate suppliers of enhanced services. Furthermore, in our view, the appropriate issue for the regulator is to evaluate the social welfare impacts of a resale or sharing activity and not simply whether it is primarily basic or enhanced in nature. The former is more likely to occur in a broad review of different categories of reselling and sharing activity.

Suggested Extensions of Study

The time and budget constraints of this study prevented us from surveying small companies which could represent significant portion of the market for resellers services. A survey of this segment should help determine whether the demand for reselling is broadly based across all size groups of Canadian companies and also whether small firms anticipate similar benefits from reselling and sharing, as do large firms.

Another potentially useful extension is a closer evaluation of the relationship between changes in bulk and MTS prices and telco revenues as developed in our mathematical appendix. The key consideration here are price elasticities of demand and the likely price behaviours of telcos under liberalized reselling and sharing. We propose to evaluate in more depth and detail the conventional argument that with reselling and sharing, telcos will increase bulk rates and decrease MTS rates. We also would explore the revenue implications of different pricing responses using elasticity coefficients that have been estimated by telecommunications economists.

Finally a further investigation of services where resale is taking place under various regulatory scenarios will provide additional evidence of the motives for and impacts of reselling and sharing. Some possible activities include telex service and telex interconnect. Similarly, it should be possible to assess more closely the potential impacts of sharing through case studies of sharing arrangements such as the one operated by the Toronto Stock Exchange.

Footnotes

1. For an analysis of the forces challenging the regulated structure of the telecommunications industry, see Organization for Economic Co-operation and Development, Telecommunications: Pressures and Policies for Change, Paris: Director of Information, 1983.
2. For a review of competitive developments in the U.S. telecommunications industry, see (among others) John Langdale, "Competition in Telecommunications", Telecommunications Policy, December, 1982, pp. 283-299. For an overview of competitive developments in the broader North American context, see Manley Irwin, Interexchange Competition and Related Issues, submission to CRTC in respect of CRTC Telecom Public Notice 1984-6, on behalf of the Director of Investigation and Research, Combines Investigation Act.
3. The only comprehensive study of reselling in the North American context of which we are aware is Goss, Gilroy and Associates Ltd, A Study of Telephone Resale and Sharing in the United States and Canada, mimeo, Ottawa, October 5, 1984. This study also outlines milestones of telecommunications deregulation in Canada and the United States.
- 3a. James Criner, "Telecommunications Resale: A Policy Analysis", Telecommunications Policy, September 1977, pp. 319-328.
4. See Director of Investigation and Research, Combines Investigation Act, Submission Re. Interexchange Competition and Related Issues, CRTC Telecom Public Notice 1984-86, July 11, 1984, and Northwest Tel, Submission in Response to CRTC Telecom Public Notice 1984-86: Interexchange Competition and Related Issues. On the other hand, CNCP has suggested that if the telcos believe that resellers can stimulate the market at a cost less than the telcos' marketing and sales personnel would incur, then the telcos may allow a margin between bulk and unit prices to persist. In general, CNCP has argued that the ramifications of the lifting of restriction on resale and sharing cannot be forecast with any certainty because so much depends on the actions of telcos in response to that prospect. See CNCP

Evidence: Resale and Sharing, April 30, 1984, p.19.

5. See the Canadian Association of Data and Professional Services Organization, Submission to: The Canadian Radio - Television and Telecommunications Commission, January 1983.
6. See Notes for a Speech on an Agenda for Telecommunication Policy Change, by Lawson Hunter, to IRPP/Telecom Canada Conference on Competition and Technological Change: The Impact on Telecommunications Policy and Regulation in Canada, September 26, 1984.
7. See Testimony of John W. Wilson Before the Canadian Radio-Television and Telecommunications Commission - Interexchange Competition and Related Issues - Telecom Public Notice, 1984-6; July 1984.
8. See Director of Investigation and Research, op. cit., p. 16.
9. See CNCP, op. cit., pp. 21-22.
10. B.C. Tel, Memorandum of Evidence: Interexchange Competition
11. OECD, op. cit., p.100.
12. Manley Irwin, op. cit., p.21.
13. B.C. Tel, op. cit., p.48.
14. See Northwest Tel, Submission in Response to CRTC Public Notice 1984-6: Interexchange Competition and Related Issues, p.18.
15. See Peat Marwick, Impacts of Competition In Message Toll Telephone Services, A Study Carried Out for the Department of Communications and Provincial Governments, September 1984, p.IX-15.
16. See Bell Canada, Response to Interrogatory - Bell (CRTC), July 27, 1984-300 IC, September 10, 1984, p.32.
17. Ibid., p.28.

18. Terra Nova Telecom puts it this way: "Adjusting toll rates downward, in the direction of cost, would therefore be required to lessen the spread between bulk rates and message toll. It is possible that there would be some increase in the volume of toll traffic due to stimulation resulting from the lower toll rates and/or competition. This will not likely offset the loss of business to competitors and the loss of revenue through rate reductions. See Terra Nova Telecom,
19. See Director of Investigation and Research, op. cit., p.5.
- 19a. CNCP, op. cit.
20. The equation of the BULK l curve is simply $BULK1 = CO1/N$, where CO1 is the fixed charge and N is the number of calling minutes.
21. The emerging environment for the resale of enhanced services in Canada is described in Canadian Radio-television and Telecommunications Commission, Telecom Decision CRTC 84-18, Enhanced Services, Ottawa, July 12, 1984. We shall have more to say about the Canadian environment surrounding the resale of enhanced services in a later section.
22. Goss and Gilroy, op. cit., p.18.
23. Author's interview with Mr. James Tobin, Attorney for Lexitel, a U.S. reseller, October 4, 1984.
24. Goss and Gilroy, op. cit., p.18.
25. Ibid., p.19.
26. Given a fixed component to the discounter's charge, there is an indivisibility introduced into the "break-even" calculation for the subscriber.
27. See H.N. Janisch, Winners and Losers: The Challenges Facing Telecommunications Regulation, Paper prepared for IRPP Conference on Competition and Technological Change: The Impact on Telecommunications Policy and Regulation in Canada, Toronto, September 25-26, 1984, pp.53-55.
28. Author's Interview with Mr. James Tobin.

29. This point was addressed in the author's interview with Mr. Gerry McAndrews, Executive Director, Alltel Inc.
30. See Comments of the Canadian Business Equipment Manufacturers Association Concerning Enhanced Services, CRTC Telecom Public Notice 1983-72.
31. In Appendix B, a list is provided of organizations that either granted us personal interviews, or responded to our structured telephone interviews.
32. Several of our responding organizations were already involved in a sharing arrangement. For example, Wood Gundy shares TELPAK lines with other brokerage companies through its membership in the Toronto Stock Exchange. However, their agreement represents a billing division, not a technical division. That is, the TSE purchases bulk capacity for its members (obtaining a discount) but the individual members pay Bell Canada directly.
33. Interestingly, the respondent for the Federal government indicated an interest on the government's part in sharing satellite services with telcos and large corporations.
34. As an illustration, the Federal government reportedly blocks 5% of the calls in peak period on its network, whereas the major telcos only block 2% as a maximum blockage factor, and most would prefer no blockage.
35. In an interview with the author, Mr. Gordon Cameron of B.C. Tel acknowledged that in specific cases, it might be profitable for resellers to use Telpak. Mr. Al Wallace of Bell Canada indicated to us his belief that profitable opportunities might also exist to take high usage WATS (with high discount) and resell capacity to (or share capacity among) medium WATS users.
36. Reselling and sharing in the local sector is currently restricted by rules that require every subscriber to have a trunk route.
37. For our sample, these include: IBM, Sears, Toronto Stock Exchange, Via Rail, Xerox, Holiday Inns, Air Canada, and CTG. The position of the government respondents is complicated by the fact that a major

political issue is involved in allowing government institutions to compete in the private sector.

38. Additional support for this assessment was provided in an interview with Michael Routtenberg, president of Longnet, a Vancouver - based reseller. Mr. Routtenberg indicated to us that price arbitrage is currently the main motive for Longnet's reselling activities.
39. Personal interviews were conducted with representatives of Bell Canada and B.C. Tel. A questionnaire survey was mailed to CNCP, Telesat Canada and Sask Tel. Unfortunately, the latter company chose not to participate in our project.
40. See CNCP, Evidence: Resale and Sharing, April 30, 1984, mimeo.
41. In the case of its space segment services, Telesat believes that carriers and broadcasters would be the major groups entering the market as resellers.
42. Correspondence to the author from CNCP. To be sure, B.C. Tel indicated in an interview that cross-border resellers will remain a significant force in the market as long as opportunities for price arbitrage exist.
43. OECD, op. cit., p.100.
44. Author's interview with Ian McGibbon of the Bank of Montreal and Pat Learmont of The Canadian Bankers Association.
45. See Bell Canada, Response to Interrogatory -- Bell (CRTC), July 27, 1984 --3001C; September 10, 1984, pp.33-34.
46. Interview with Ian McGibbon and Pat Learmont.
47. Given the substantial amount of excess capacity in bulk services reported by our respondents, the volume effect of a decline in the (implicit) average price of bulk services might be fairly modest.
48. For some up-to-date evidence on elasticities of demand for telecommunications services, see Lester Taylor, "Problems and Issues In Modeling

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- Telecommunications Demand", University of Arizona, mimeo, 1984.
49. Gerald Brock, The Telecommunications Industry: The Dynamics of Market Structure, Cambridge, Mass: Harvard University Press, 1981.
50. Ibid., p.245
51. Chester Fenton and Robert Stone, "Competition in the Terminal Equipment Market", Public Utilities Fortnightly, March 31, 1977, p.26. Manley Irwin notes that some PBX equipment includes as many as 122 features. See Manley Irwin, op. cit., p.13.
52. Ibid., p.26.
53. Brock, op. cit., p.246.
54. See Theresa Tedesco, "CRTC puts CNCP on hold", The Financial Post, October 13, 1984, S10.
55. A good overview of interconnect competition in Canada is found in ICA Telemanagement Inc., The Interconnect Industry in Canada: 1983, Willowdale, Ontario, mimeo, 1983.
- 55a. See Judith Cole, "Interconnect - where to now?", The Telecommunications Report, January/February 1985, p.26.
56. ICA Telemanagement, Inc., op. cit., pp.157-158.
57. Ibid., pp.173.
58. Steven Flax, "Whirlwinds Hit The Yellow Pages", Fortune, October 1, 1984, p.113.
59. Ibid., p.114.
60. S Wing, Freight Forwarding In Canada, Strategic Planning Group, Transport Canada, Ottawa, March 1984, pp.43-52.
61. See "Assembly and distribution; new outlook", Handling and Shipping Management, November 1984, pp.85-90.
62. Telesat Canada, Evidence on Interexchange Competition and Related Issues, CRTC Telecom Public

Notice, 1984-6; April 27, 1984.

63. Telesat Canada, Response to Interrogatory; Telesat (CRTC) 22 May 84 - 100 IC, June 20, 1984.
64. See CNCP, Evidence: Resale and Sharing, April 30, 1984, mimeo, p.9.
65. As an example, 22 Texas resale carriers recently announced that they were close to forming a long-distance co-operative to buy transmission capacity in bulk and bypass facilities currently leased from AT&T Communications Inc. Their action was prompted by a recent WATS rate restructuring plan proposed by AT&T to the Texas Public Utilities Commission. AT&T had also proposed to reduce the intrastate long-distance rates it was charging customers. Under the co-op plan, each of the resellers will own 1/20th of the new company, tentatively called TexNet. The new company will sell switching and private line services to its owners at a reduced rate. It will also try to negotiate discounts on lines leased outside of Texas. See John J. Keller, "Texas Resellers Plan Co-op to Bypass AT&T Facilities", Communications Week, November 19, 1984.
66. See Terra Nova Tel. Inc., Response to Interrogatory #100, CRTC May 22, 1984, June 18, 1984.
67. This suggestion has been made by the Canadian Industrial Communications Assembly.
68. James C. Criner, "Telecommunications Resale: A Policy Analysis", Telecommunications Policy, September, 1977, pp.319-328.
69. Ibid., p.324.
70. The only public-interest concern surrounding the activities of resellers would be that access costs are fully recovered.
71. This assertion is reinforced by the sketchy and highly qualified estimates of the revenue impacts of resale and sharing provided by the common carriers in the recent IX hearings.
72. It is our understanding that some reselling of basic Telex service is taking place in Canada. However, as the reselling taking place does not appear to be

eroding the revenues of CNCP, no legal challenge has been raised. Indeed, there is some feeling in the industry that CNCP's telex revenues have been stimulated by reselling. Were this found to be the case with the reselling of basic telephone services, "pure" price arbitrage practices might still be seen as promoting the social interest.

APPENDIX A

Suggested Questions for Potential Resellers and Users of Resold Telephone Services

Name of Company

Name of Respondent

Date of Interview

Telephone

Status

Address

- 1) Nature of company business/products; geographic areas served.
- 2) Total number of employees and yearly sales
- 3) Descriptions of company's telephone usage patterns:
 - a) Does company use bulk services such as WATS lines, private lines or Telpak? If not, why not?
 - b) Estimate total annual or monthly telephone bill
 - c) What portions of the company's telephone communications traffic represents data traffic? (Confirm that the rest is voice traffic)
 - d) What portions of the company telephone communications traffic is related to long distance calling (answer might be based on actual traffic studies or on a breakdown of telephone charges)
- 4) If answer to 3a is yes, does your company utilize the bulk circuits taken to full capacity? If not, is the company seeking to fill out this excess capacity? How?
- 5) Are you familiar with the reselling and sharing of telephone lines that is going on in the U.S.? If yes, what consequences of the U.S. experience would be particularly relevant to your company if duplicated in Canada?

- 6) If answer to 5 is yes, what recent (or prospective) technological changes do you think will affect the environment for resale and sharing over the foreseeable future? e.g. fibre optic cable increases the bandwidth capacity of circuits making sharing more attractive.
- 7) If it were legal would your company be interested in reselling some of its bulk capacity to third parties and/or sharing the capacity with third parties. If not, why not?
- 8) If the answer to 7 is yes, is the company interested in the potential for becoming a for profit reseller (or broker) of telephone services? What types of services might be of interest to the company in its capacity as reseller- e.g. interprovincial data and/or voice traffic, toll service between Canada and the U.S., intra local traffic
- 9) What factors in the environment do you believe currently contribute most significantly to profitable opportunities for reselling and sharing:
 - a) price differences between bulk rates and rates for message toll service?
 - b) opportunities to "add value" to basic transmissions services
 - c) opportunities to provide customized billing and pricing techniques for specialized groups of customers
- 10) What specific companies do you think might be interested in Canada in becoming resellers of telephone capacity or brokers of shared capacity?
- 11) Are any affiliates or divisions of your company currently involved in reselling or sharing activities in the U.S. or Canada? If yes, indicate:
 - a) Nature of customers
 - b) Main competitive advantage provided by company to its clients e.g. lower prices, special services etc.

c) Descriptions of physical plant i.e. whose lines are being resold? number of trunk lines rented? number of switches?

- 12) Are there any special billing and/or tariffing procedures that you would like to see implemented by the telephone company? (i.e. time of day recording of telephone calls on itemized bill, leasing circuits on long term basis, eliminations of minimum blocks of time charged for WATS lines)
- 13) What enhancements of basic telephone service are of interest to you (e.g. call forwarding, electronic mailbox) Are you currently using any of these?
- 14) What would be the main hoped-for benefits of increased competition in the telephone industry to your company?

APPENDIX B

Organizations That Participated In Interviews

Abitibi - Price
Air Canada
Alltel
B.C. Rail
B.C. Telephone
Bell Canada
Blake, Cassels and Graydon
Canadian Bankers Association
Citibank Leasing
CNCP Telecommunications
Commonwealth/Holiday Inn
CTG Ltd.
Datel
Government of Canada
Government of Ontario
Gulf Canada
IBM Canada
Imperial Oil
A.E. LePage
Lexitel
Longnet
MacMillan Bloedel Ltd.
Olympia and York
Ontario Hydro
Price Waterhouse
Sears
Stelco
Telesat Canada
Toronto Stock Exchange
Vancouver General Hospital
Via Rail
Wood Gundy
Workers Compensation Board
Xerox Canada

APPENDIX C

The Relationship Between Price Elasticities and The
Revenue Impacts of Price Arbitrage

Our discussion in the text emphasized that the impact of reselling and sharing on common carrier net revenues is difficult to predict on a priori grounds. In particular, the impact crucially depends upon own - price and cross - price elasticities of demand for bulk and MTS service, as well as upon the pricing responses of the common carriers. The purpose of this appendix is to elaborate upon this argument using mathematics. For convenience, we assume that resale and sharing has no significant impact on common carrier costs. This allows us to focus on the revenue implications of reselling and sharing which, in any event, are likely to be the major consideration, insofar as the sustainability of cross - subsidization is concerned.

It is convenient to think of a carrier's total revenues as coming from two sources: revenues from bulk subscription services (TRb) and revenues from MTS (or retail) services (TRr). Total revenue is therefore given as:

$$R = TRb + TRr$$

Furthermore, if:

- Qb = quantity of bulk services
- Qr = quantity of retail services
- Pb = average price of bulk services
- Pr = average price of retail services
- eb = price elasticity of demand for bulk services
- er = price elasticity of demand for retail services
- ebr = cross price elasticity of demand for bulk services with respect to retail prices
- erb = cross price elasticity of demand for retail services with respect to bulk services

then:

$$(1) Q_b = f(P_b, P_r)$$

$$(2) Q_r = f(P_b, P_r)$$

$$(3) R = Q_b P_b + Q_r P_r$$

Revenue as a function of P_r and P_b :

From (1) since we want to define revenue as a strict function of P_b and P_r :

$$dQ_b = \frac{\partial Q_b}{\partial P_b} dP_b + \frac{\partial Q_b}{\partial P_r} dP_r = \frac{-Q_b}{P_b} e_b dP_b + \frac{Q_b}{P_r} e_{br} dP_r$$

Where dQ_b is the total differential for Q_b . Integrating both sides of the equality:

$$\int \frac{dQ_b}{Q_b} = -e_b \int \frac{dP_b}{P_b} + e_{br} \int \frac{dP_r}{P_r} \Rightarrow \ln(Q_b) = -e_b \ln(P_b) + e_{br} \ln(P_r)$$

Therefore

$$(4) Q_b = P_b^{-e_b} P_r^{e_{br}} \quad \text{similarly from (2):}$$

$$(5) Q_r = P_r^{-e_r} P_b^{e_{br}} \quad (\text{assuming } e_{rb} = e_{br})$$

replacing (4) and (5) in (3)

$$R = P_b^{(1-e_b)} P_r^{e_{br}} + P_r^{(1-e_r)} P_b^{e_{br}}$$

Changes in revenue can be formulated as

$$(6) \quad dR = \frac{\partial R}{\partial P_b} dP_b + \frac{\partial R}{\partial P_r} dP_r \quad \text{====>}$$

$$dR = \left[(1-e_b) \frac{-e_b}{P_b} + \frac{e_{br}}{P_r} + \frac{(1-e_r)}{P_b} \frac{(e_{br}-1)}{P_b} \right] dP_b + \left[\frac{(1-e_b)}{P_b} \frac{(e_{br}-1)}{P_r} + (1-e_r) \frac{-e_r}{P_b} \frac{e_{br}}{P_b} \right] dP_r$$

The revenue differential expressed as equation (6) illustrates our argument that own - price elasticities and the cross - price elasticity between bulk and retail are the critical coefficients determining the revenue implications of reselling and sharing.

We can go a step further in this analysis to draw some tentative conclusions. From equation (6), if we assume that P_r is constant, then $dP_r = 0$ and the equation becomes:

$$(7) \quad dR = \left[(1-e_b) \frac{-e_b}{P_b} + \frac{e_{br}}{P_r} + \frac{(1-e_r)}{P_b} \frac{(e_{br}-1)}{P_b} \right] dP_b$$

Given equation 7, it can be shown that a higher own - price elasticity of demand for bulk services (i.e. a higher value for e_b) results in a decreasing revenue when P_b increases. A higher cross - price elasticity (i.e. a higher value for e_{rb}) results in increasing revenue when P_b increases.

Similarly if we assume P_b constant, we can show that a higher own - price elasticity of demand for retail services results in decreasing revenue when P_r increases.



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