The Impact of International Competition on the Canadian Telecommunications Industry and Its Users

A Study Jointly Sponsored by the Governments of

Alberta, Manitoba, Nova Scotia, New Brunswick, Newfoundland , Ontario, Prince Edward Island, Quebec, Saskatchewan, Canada

Conducted By:

D.A. FORD AND ASSOCIATES LTD.
in association with
Informetrica Limited and
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August 29, 1986

Mr. D.W. MacEwen
Chief, Industry Structure Analysis
Telecommunications Policy Branch
Department of Communications
300 Slater Street
Ottawa, Ontario
K1A 0C8

Dear Mr. MacEwen:

I am pleased to submit to you and to the members of the Federal-Provincial Project Steering Committee our final report on "The Impact of International Competition on the Canadian Telecommunications Industry and its Users". This report is based on research which was carried out during the period January to March, 1986.

On behalf of our Firm, Informetrica Limited and Ben Johnson Associates, Inc., I would like to express our thanks to you and your colleagues for the opportunity to conduct this research. It has provided us with a comprehensive understanding of this complex subject area. We are also indebted to the many firms and individuals who took the time to meet with us and to compile the detailed information which we required for the study.

Both the study and this report have benefitted from

NOTE FROM THE SPONSORS

This study was commissioned by the federal government and the governments of Newfoundland, Nova Scotia, New Brunswick, Prince Edward Island, Quebec, Ontario, Manitoba, Saskatchewan and Alberta. It forms part of a joint program to develop a common base of social and economic information on the telecommunications industry which will assist ministers in developing a national telecommunications policy.

The findings and conclusions contained in this report are those of the consultants who conducted the study, and these views are not necessarily shared by the sponsoring governments.

The present report provides valuable information with respect to the incentives for diverting traffic through foreign telecommunications carriers, the extent of such activities, and the relative cost of business telecommunications in Canada and the United States. Its findings in this regard will be useful to both governments and regulators in their current assessments of issues relating to the pricing of telecommunications services.

In the final section of the report, an econometric model is used in an attempt to estimate the theoretical impact on the Canadian economy of adjusting telecommunications rates for business services, so that business telecommunications costs in Canada would be equal to those in the United States. The methodology employed by the consultant assumes a reduction in business telecommunications rates without requiring any corresponding adjustments within either the telecommunications sector or the Canadian economy as a whole to balance the costs of the reduction. This assumption has the effect of generating results which suggest some stimulative effects on employment, income, and economic growth. Since this study assumes no corresponding increase in telecommunications costs for any other class of user or in any other sector of the economy, readers should assess the results of the modelling exercise accordingly.

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EXECUTIVE SUMMARY

INTRODUCTION

This report documents the findings of an intensive investigation into two related aspects of the telecommunications industry in Canada. One aspect was concerned with the phenomenon of international competition or "international bypass" as it is often termed. The second aspect studied the impact on Canadian industry and the Canadian economy of bringing Canadian telecommunications rates to the level of those in the United States.

BACKGROUND TO THE STUDY

The telecommunications industries in Canada and the United States are similar from a structural, technological and regulatory perspective. However, differences have existed over the years, particularly in the rates for long distance telecommunications services. Until recently, the magnitudes of these differences in rates have been insufficient to cause serious dislocations in the provision of long distance services in Canada.

Recent reductions in the rates for U.S. long distance services have increased these differences in rates. This situation has caused pressure on Canadian telecommunications regulators and policy-makers in two ways. First, Canadian businesses are aware of the differences in rates, and there is concern for the impact on the competitiveness of Canadian industry. Second, the rate differentials themselves have created perceived economic incentives to avoid Canadian telecommunications carriers in favour of U.S.-based alternatives. In other words, the difference in long distance rates increases the cost of doing business in Canada compared to the U.S., and the difference in rates also causes firms to look for cheaper ways to meet their communications needs, sometimes by "bypassing" Canadian carriers through the use of lower cost U.S.-based service providers.

This study of the impact of international competition was developed to examine these two related issues. The first part consisted of an assessment of the extent of international competition, commonly referred to as "bypass". As we explain in the report, the term "bypass" has a variety of often conflicting interpretations. Our approach has been to give the term as wide a meaning as possible. Accordingly, we investigated the range of ways in which Canadian telecommunications facilities and services are or can be avoided.

The second part of the study consisted of a simulation of the impact on Canadian industry and the Canadian economy of removing the business rate discrepancies between Canada and the U.S. by adopting U.S. business telecommunications rates in Canada.

FINDINGS OF THE STUDY

With respect to international competition or "bypass", much of the investigation in this part of the study involved discussions with major users and carriers about what is technically possible, legally permissible and economically viable. Across the range of voice, data, message and image services, major users on occasion develop alternative methods of communication which minimize costs through the use of non-conventional routings. Technical descriptions are provided in the main body of the report. Our findings with respect to the extent of international competition are as follows:

- The impact on carrier revenues is of the order of $4.6 million annually.

- Of this amount, approximately $1.5 million is the loss of settled Canada-U.S. toll revenues due to cross-border resale.

- The remaining $3.1 million is the loss of Canada-Canada, Canada-U.S. and Canada-Overseas Telex revenues through discount message service providers and U.S.-based international Telex carriers.

No estimates of the loss in revenue due to off-ending from private lines or private network nodes terminating in the U.S. were available, but most private lines and private networks are established primarily for intra-corporate communications.

With respect to differences in telecommunications costs, certain telecommunications rates, particularly long distance rates, are much lower in the United States than they are in Canada. For example, even taking into account the current exchange rate of approximately 1.40, we calculated the following average differentials for domestic services:

- Message toll rates are 37% lower.
- Private line voice rates are 49% lower.
- Private line data rates are 52% lower.

However, it should also be noted that the rates for access to the local network are often higher than they are in Canada. While these comparisons are difficult to make, a review of PBX trunk rates across nine states showed that the rates for comparable services were anywhere from 35 percent lower to 97 percent higher than in Canada.

In assessing the impact on Canadian businesses of substituting U.S. business telecommunications rates for Canadian business telecommunications rates in Canada, a unilateral reduction in the rates for Canadian businesses to the rate levels currently in effect in the U.S. was provided, and the impact on the economy was analyzed. The reduction in business telecommunications costs increases from $675 million in 1986 to $879 million in 1990. No corresponding increase in telecommunications costs was assumed to be borne by any other sector of the economy or any other class of subscribers since the burden could not be assigned to any particular group without making certain policy assumptions regarding its distribution within the economy. Although several policy options, such as an explicit government subsidy or some form of rate adjustment, could have been identified and examined, and corresponding sets of assumptions built into the model, this was outside the terms of reference for the study. Had the revenue shortfall been assigned to one or other category of

service or customer, the results of the analysis would have been different. We understand that such policy questions are currently under consideration by telecommunications policy-makers and regulators at the federal and provincial levels.

The impact analysis was conducted using Informetrica's econometric forecasting model. A forecast with business telecommunications expenditures reduced by the difference between Canadian and U.S. telecommunications rates was compared with Informetrica's reference forecast. The main impacts demonstrated by the analysis were:

- By 1990, Gross National Expenditure increases by 0.2 percent above the base case value.

- By 1990, employment increases by 20,000 person-years.

Regional impacts of lowering telecommunications costs show the greatest benefit in the manufacturing-oriented provinces, such as Ontario and Quebec. All regions of the country would benefit to some extent.

With respect to the impact on the competitiveness of Canadian industry of such a price change, the impact on exports is positive, indicating that lower telecommunications costs do improve the competitive position of Canadian industry. With respect to the attractiveness of Canada as a location for business activity, responses to questions on this subject indicated that while the cost of telecommunications services is sometimes a consideration, it is rarely a primary consideration even for the location of company facilities within Canada. The single exception to the above was one firm which transferred 30 jobs to the United States solely because of their lower telecommunications costs.

DISCUSSION OF FINDINGS

While the current extent of international competition does not appear to be significant, the study served to highlight the difficulties which face regulators and policy-makers in the telecommunications field. The main protection for Canadian telecommunications carriers from international competition or "bypass" is the currently high cost of access to alternative service-providers in the U.S. Both the current Canada-U.S. exchange rate and the tariff restrictions on sharing and resale serve to keep the cost of access to cross-border resellers and other service providers in the U.S. high. However, there is concern among the carriers that changes in the sharing and resale restrictions could affect the cost of access to a significant extent.

The findings with respect to the impact of bringing telecommunications rates for Canadian business to the level of those in the U.S. indicate that benefits would accrue to most sectors of the economy and all regions of the country. It is important to examine not only the absolute magnitude of the impact, but also the magnitude in relation to the cost, or the "effectiveness" of the change. In our view, the reduction in telecommunications expenditures examined in this study has a more favourable impact on the economy than would reducing personal income taxes by the same amount. Reducing personal income taxes has a greater impact on the demand for imports than does making an equivalent reduction in the price of a domestically produced good or service such as telecommunications services.

Finally, the elimination of rate differentials between the U.S. and Canada would not eliminate entirely the use of non-Canadian facilities. Off-ending into the local networks from Canada-U.S. tie-lines or private networks and the use of private lines to access certain U.S. services would continue because the economic incentives to do so are created by differences between domestic and cross-border rates, not merely by rate differentials between similar domestic services.

INTRODUCTION

In this section of the report, we provide the background to the study, followed by a summary of the terms of reference. Then we provide a discussion of the major issues, a description of our approach to the study, and a statement of the major assumptions which were used during the data collection and analysis phases of the study.

BACKGROUND

Historically, telecommunications services in Canada and the United States developed along very similar lines, following for the most part similar technological developments and responsive to similar policy and regulatory thrusts. While the two countries have maintained sovereignty with respect to telecommunications, they have both developed highly integrated and efficient systems. Differences have existed over the years, particularly in the rates for long distance telecommunications services, reflecting differences in geography, demographics, and regulation.

With respect to differences in long distance rates, it has been generally perceived that the rates for comparable services have historically been priced higher in Canada than in the United States. Until recently, the magnitudes of the differences in rates have been insufficient to cause serious dislocations in the provision of long distance services in Canada.

Recent reductions in the rates for U.S. long distance services have, however, exacerbated the rate differences. Concern for this situation exists on two broad fronts: the impact of the rate differentials on the costs of doing business in Canada, and the emergence of user interest and activity in alternative, non-conventional traffic routings using, for the most part, cross-border resellers, interstate carriers and international carriers for voice and message communications. The former brings into question the relative competitive ability of Canadian business users and the attractiveness of Canada as a place for business activity. The latter raises questions with

respect to the impacts on all Canadian carriers, particularly in regard to the financial impact of lost revenues, but also with respect to maintaining the integrity and sovereignty of Canadian networks.

TERMS OF REFERENCE

The terms of reference developed by the Federal and Provincial sponsors of the study contained the following objectives:

> "1. Through a careful comparison of U.S. and Canadian long distance rates, to determine the impact of the current pricing structure differential between Canadian and U.S. long distance telecommunications services on the competitive ability of Canadian business users and the attractiveness of Canada as a location for business activity.
>
> 2. To identify and quantify the extent of current bypass of Canadian facilities and forecast the extent of bypass over the next five years.
>
> 3. To identify the economic and non-economic incentives which encourage bypass, and the extent to which the current bypassers are sensitive to rate changes on each side of the border.
>
> 4. To estimate the impact of current and future bypass on the revenues of individual carriers which would include each of the members of Telecom Canada (including Telesat), Teleglobe, and CNCP Telecommunications."

The terms of reference also stated that this analysis should be done on a national and provincial basis.

MAJOR ISSUES

In order to put the objectives of the study into perspective, we first provide a brief discussion of the issues relating to differentials between business telecommunications costs in

Canada and the U.S. In this context, we conclude that this problem should be studied from the point of view of total telecommunications costs, not just long distance costs.

Following the discussion of business telecommunications costs, we provide a discussion of the background and issues relating to international competition. We suggest that international competition should be viewed in a very broad context, including all aspects of voice, data and message traffic. We also conclude that, through the Telecom Canada Revenue Settlement Plan, international competition has revenue implications for all Telecom Canada members, not just those members directly affected, as well as for CNCP Telecommunications and Teleglobe Canada.

Issues Regarding Telecommunications Costs for Business

Except for short-haul toll (less than 150 miles), toll charges are generally lower in the United States than they are in Canada on a comparable mileage basis, although ease of access and both the level and quality of service can vary from one carrier to another. PBX's offering least-cost routing can help a firm to minimize toll costs when many options are available. However, some services, such as Telpak, are not available in the U.S. The relative Canada/U.S. rates for these services and the full range of other telecommunications services used by businesses are examined in detail in the chapter on telecommunications costs.

It should be emphasized that our approach to this part of the study involved a comparison of total business telecommunications rates between Canada and the United States, not merely a comparison of long distance rates. Total telecommunications costs include the costs of access, local services and long distance services. Long distance services can include any or all of message toll, WATS, private lines, foreign exchange, data including packet switching, private networks, satellites, etc. The ability to interconnect services from more than one supplier, to combine voice and data, and to use customer-provided terminal equipment can also have a significant impact on overall telecommunications costs.

Issues Regarding International Competition

Alternative, non-conventional traffic routings which avoid, in part, the use of Canadian telecommunications facilities and services can take place for a number of reasons. Most of those reasons can be based on some form of economic rationale derived directly from the rates. It can also include such non-economic reasons as availability, flexibility, reliability, quality and diversity of service. Until recently, there has been no attempt in Canada to price toll services based on the costs of providing services; rather, a value-of-service pricing philosophy has been followed, with regulators generally attempting to keep local access rates low at the expense of increased toll rates.

When toll rates are priced above costs, it creates an opportunity for new market entrants to provide services below the rates charged by existing carriers, but above cost. The process is similar to "arbitrage", in which stock or currency traders buy and sell at the same time in different markets to take advantage of small price differentials, but with no investment and little risk. Resellers are usually not facilities-based carriers. Instead, they provide service using leased facilities, taking advantage of the price differentials, for example, between message toll rates and WATS or private line rates. Since the opportunity is created by rates which are not "economic" in the sense of being cost-based, these services are often termed "uneconomic bypass", although they certainly make economic sense for the user. For the facilities-based carrier, however, they represent an unfair form of competition in that the facilities-based carrier is required to charge the uneconomic rates as a result of regulatory decisions in support of other objectives.

Proceedings Before the CRTC Respecting International Competition

In response to the emergence of cross-border resale activities in its markets, B.C. Tel applied to the CRTC for permission to block calls to resellers with facilities located just across the Canada-U.S. border, and also to restructure its Canada-U.S. rates. In Telecom Decision CRTC 85-7 rendered April 4, 1985, the Commission denied B.C. Tel's application to block calls, but approved the proposed restructuring of Canada-U.S.

message toll rates which resulted in an increase in short-haul rates, and a reduction in long-haul rates. For example, the rate for a five-minute Vancouver-Seattle call increased 23.3%, while the rate for a five-minute Vancouver-New York call was reduced 21.1%. Very short-haul rates increased dramatically under this tariff filing.

A similar application for restructuring of Canada-U.S. rates by Bell Canada is pending before the Commission under Tariff Notice 1643. This proposal would increase the rate for a five-minute Toronto-Detroit call 10.8%, and lower the rate for a five-minute Toronto-Los Angeles call 18.5%. Very short-haul rates, such as Windsor-Detroit, would increase even more dramatically under the proposed tariff. The result of such rate restructuring is to significantly decrease the commercial viability of Canada-U.S. resale.

The Impact of International Competition on Canadian Carriers

The main impact on Canadian carriers is the loss of revenues to resellers and discount message service providers, although short-haul revenues to the resellers' facilities offset these losses in part for voice services carried on short-haul toll or private lines. CNCP Telecommunications is subject to revenue loss through the interconnection of non-Telex circuits to Telex circuits outside Canada. Teleglobe Canada loses revenue to both U.S.-based international voice and message carriers when international traffic is routed via the U.S.

Apart from revenue implications for the carriers, international competition can, particularly in the extreme, have an impact on the ability of the carriers to maintain the integrity and sovereignty of Canadian telecommunications.

APPROACH TO THE STUDY

The approach to this study was developed to satisfy the requirements of its two major aspects, International Competition and the Impact of Telecommunications Cost Differentials. The approach to these two aspects largely converged in respect of

sources of information, but diverged in respect of the analysis. For each of the two study aspects, major activities centred around information gathering from applicable Canadian and U.S. sources, and the analysis of available data. Specifics of activities and emphasis are presented in the more detailed descriptions which follow.

Information Sources

As indicated, the two aspects of the study largely converged in respect of sources of information. The major source of information was a survey of large businesses throughout Canada. The following overall criteria guided the choice of companies included in the survey:

- Regional Representation - all regions of Canada were included.

- The Anticipated Usage of U.S. Competitive Services - Large companies with large telecommunications expenditures were expected to have a higher propensity than small companies to access U.S. competitive services and thus were included.

- The Importance of Telecommunications as a Cost of Doing Business - Representative companies with a high percentage of telecommunications costs were included.

- The Requirement to Cover a Range of Industrial Sectors - Representative choices were made from approximately 200 industry sectors of the Statistics Canada Input-Output Tables.

The final list of companies included in the survey was decided in discussion with the Federal-Provincial Project Steering Committee.

Approximately 50 companies from across Canada were approached for inclusion in the survey. Personal interviews were conducted by senior consultants from the Firm with senior company employees involved directly in the control and management of telecommunications services. Additional information on the telecommunications costs of small and medium sized businesses was obtained by a telephone survey of approximately 40 companies located in the Ottawa area and representing a broad cross-section of types of businesses.

Personal interviews with the major telecommunications carriers throughout Canada provided supplementary information regarding both aspects of the study. Included were all Telecom Canada members, Telecom Canada central staff, CNCP Telecommunications and Teleglobe Canada. The carriers provided information on the extent and nature of international competition and, where applicable and available, provided telecommunication cost profiles of typical small, medium and large business users.

The supplier side of the international competition aspect of the study was provided by personal interviews with the principals of all known companies engaged in the resale of cross-border communications services, as well as with the principal of one company which was formerly in that business.

Ben Johnson Associates, Inc., a U.S.-based consulting firm, provided an in-depth analysis of the economics of the U.S. reseller industry, a summary of which is contained in Appendix A. Additionally, Ben Johnson Associates provided much of the information on U.S. telecommunications rates used in both aspects of the study.

Approach - Telecommunications Costs

The overall thrust of this aspect of the report is an assessment of the significance of telecommunications costs as a cost of doing business in Canada as compared to the U.S. To provide this assessment, costs were obtained for all telecommunications services used by companies in the business user survey, and supplemented by cost information on typical user profiles from the carriers. Telecommunications costs thus

collected for each company were translated into what they would be if U.S. rates were substituted for Canadian rates in Canada. Telecommunications cost ratios were subsequently calculated on an industry sector basis and were used as the input to an econometric analysis of impacts.

The econometric modeling work was conducted by Informetrica Limited, an Ottawa-based firm of economic analysts. The Informetrica models were used to:

- Translate the industrially-specific estimates of telecommunications cost ratios to their impacts on the price of industrial outputs and the costs of goods and services in the economy.

- Show the impact of these price changes on the demand for goods and services, the level of activity by industry, and the resulting implications for wages, employment, income and government revenues.

As we discuss more fully in the chapter on telecommunications costs, The Informetrica Model (TIM) was used to assess the impact of telecommunications costs on the competitive ability of Canadian business users and to draw conclusions regarding the attractiveness of Canada as a location for business activity.

Approach - International Competition

The basic information regarding the extent and nature of international competition was gathered as an integral part of the survey of business users. The thrust in this aspect of the survey was to determine the actual extent, the incentives, and the means of access to U.S. competitive services (or those in other countries, if applicable). In cases where no access took place, the questions probed the reasons for not considering or for rejecting the use of such services.

Questions directed to the telecommunications carriers related to the technical aspects and extent of international competition, their perceptions of why users would access such services, actions taken or contemplated to discourage access, and the non-economic consequences, particularly on the carriers.

Questions directed to the cross-border resellers related to the actual extent of Canadian marketplace activity and the financial aspects of supplying cross-border resale services.

All sources of information regarding international competition were consolidated to form an estimate of the current extent. Forecasts of the future extent of international competition were developed using econometric information from Informetrica Limited. Relative impacts were subsequently estimated for the telecommunications carriers involved.

MAJOR ASSUMPTIONS

In this section of the report, we present a number of major assumptions used in the study, and explain the rationale underlying each assumption.

Imposition of U.S. Rate Structures

The purpose of the telecommunications costs portion of the study was to define and impose a change in the cost structure of Canadian telecommunications services, with such a change reflecting the difference in rate structures between Canada and the U.S., and to examine the impact on the economy. We should emphasize that, in so doing, we have treated the change in rates as a reduction in telecommunications costs for all business users, but we have not assumed increases in demand to cover the shortfall nor have we imposed corresponding increases in telecommunications costs for other sectors of the economy. The magnitude of the telecommunications cost reduction for business users ranged from $675 million in 1986 to $879 million in 1990.

We have assumed that these rate changes would take place without accompanying changes in the use of services. In fact, it is likely that the volume and mix of services would change, particularly if changes were made in the relative rates for interexchange services. However, data on elasticities of demand, and in particular cross-elasticities of demand, for various interexchange services was not available, and accordingly the modeling of such second order changes was not possible.

It should also be noted that the substitution of U.S. rates for Canadian rates involved only a change in rates, not an imposition of other aspects of the U.S. telecommunications environment in Canada. Most significantly, we did not impose a competitive environment for message toll service (MTS) or wide area telephone service (WATS) in Canada. However, the rate structure which results from an imposition of U.S. rates in Canada is of course derived from a competitive toll environment.

Canada-U.S. Exchange Rate

After considerable discussion with the Federal-Provincial Project Steering Committee, it was decided that the current Canada-U.S. exchange rate of approximately 1.40 Canadian dollars per U.S. dollar should be used in determining relative rates. The alternative was to use an exchange rate of 1.0 to establish the price change to be imposed through the economic model. Inasmuch as the results of the model are linear with respect to the magnitude of the price change, the exchange rate is significant only with respect to defining the base case price change.

Since the telecommunications costs portion of the study was meant to measure the relative competitiveness of U.S. and Canadian businesses in respect of telecommunications costs, it was considered more appropriate to use the current Canada-U.S. exchange rate of 1.40 Canadian dollars per U.S. dollar in determining the ratio of U.S. to Canadian telecommunications rates.

INTERNATIONAL COMPETITION

In this chapter of the report, we provide the results of our inquiry into international competition and its impact on Canada. We describe the various aspects of international competition, we discuss the situation giving rise to incentives for international competition, and we discuss the extent, forecast and impact of international competition.

DEFINITIONS AND TECHNICAL DESCRIPTIONS

The use of non-Canadian telecommunications facilities, in ways contrary to Canadian telecommunications policies or regulations, to satisfy Canadian telecommunications requirements is loosely referred to as "international bypass". The term arises because established Canadian carriers are being or can be "bypassed" by the use of foreign facilities for telecommunications requirements to points in Canada (Canada-Canada), to points in the United States (Canada-U.S.), and to point overseas (Canada-Overseas).

In our investigation, however, we have found a wide range of understandings of the term "bypass", involving, for example, the use of U.S. facilities, private networks, non-conventional access to U.S. facilities, and new competitive service offerings. In order to avoid the confusion inherent in the use of the term "bypass", we have chosen to discuss the various physical ways in which international competition does have an impact or can have an impact on Canadian carriers, and to refer to this area collectively as "international competition". International competition involves primarily the use of facilities owned by U.S.-based interstate and international voice and message carriers, although various resale arrangements are used to provide services on these facilities.

The Means of International Competition

There are several ways in which U.S. competition in the provision of telecommunications services can have an impact on Canadian carriers:

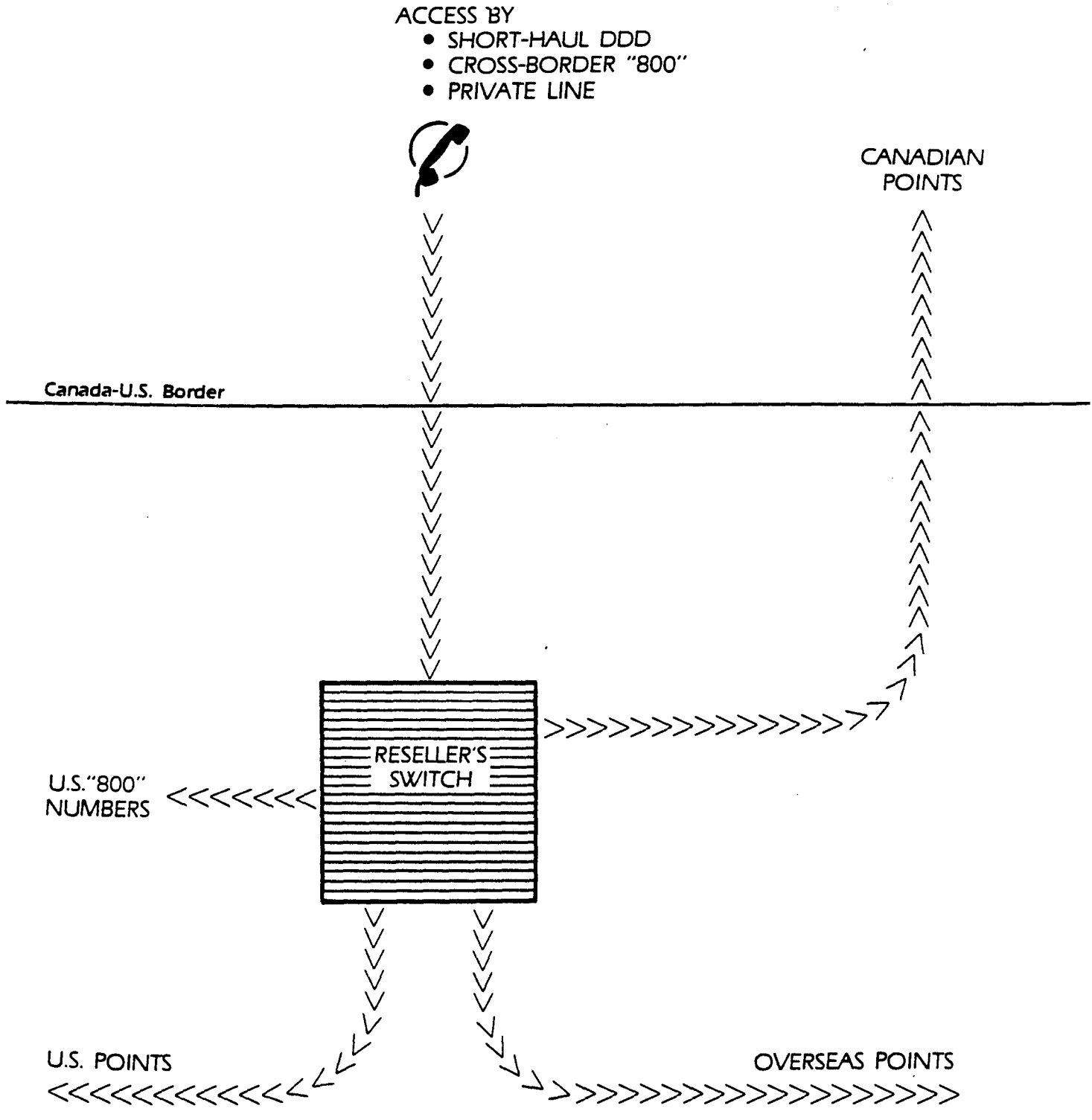
- The resale of U.S. voice and data services
- Access to U.S. voice, data and video services by private networks
- Access to U.S.-based discount message services

Each of these alternatives is explained in detail below. At this stage, we present the various alternatives of which we are aware. Some of these alternatives may violate the provisions of Canadian carriers' tariffs, others may not. Some of the examples presented may not be readily available or economically feasible at this time. We present them to provide as wide an understanding as possible of technical possibilities. Details of economic feasibility and the actual occurrences of international competition are discussed later.

The Resale of U.S. Competitive Services

With changes in the U.S. competitive situation, particularly in the resale of telecommunications services, incentives have arisen to extend the resale of U.S. telecommunications services into the Canadian market. This is achieved by providing some means of reasonable access from Canadian centers to resale operations located in the United States. Resale operations of this nature can provide alternatives to Canadian carrier facilities for Canada-Canada, Canada-U.S., and Canada-Overseas telecommunications services. An example of this type of resale operation is shown in Exhibit 1, opposite.

Exhibit 1: Cross-Border Resale



Embodied in this exhibit are two main aspects of cross-border resale: Access to the resale operation located in the U.S., and carriage to various distant points. Access may be accomplished in two ways:

- By a long distance call in which a short-haul call is placed to the reseller's switch, and a touch-tone signal is used to transmit the remainder of the call set-up information (dial access), and

- By a dedicated circuit or private line (P/L).

Dial access can include a direct distance dialed (DDD) call, or the use of cross-border "800" service. In the first instance, the customer pays the cost of access; in the second instance, the reseller absorbs the cost and includes it in the overall rate structure. Private line access can involve foreign exchange or tie trunk services linking a particular customer in Canada to the reseller's switch. Private line access can be provided on the facilities of terrestrial or satellite carriers.

The objective of the reseller is to minimize the costs of access to improve the competitiveness of the service compared to Canadian carrier alternatives. As a consequence, resale operations are located as close to the Canada-U.S. border as possible, and provide service to Canadian centers located likewise close to the Canada-U.S. border.

The carriage component comprises the second major aspect of the resale operation. Normally, the reseller acquires switching equipment by lease or purchase, and resells the basic transmission capacity provided by facilities-based U.S. telecommunications carriers (for example, AT&T, MCI, GTE-Sprint or ConTel). In some cases, transmission facilities may also be owned by the reseller. Whereas Exhibit 1 shows one switch location, reseller networks with many switching locations are also in operation. One switch location represents a minimal operation designed to serve a particular Canadian originating

location, usually in addition to serving a small region of the U.S. A system of many switches could represent a major U.S. resale operation serving Canada as an adjunct.

As previously mentioned, resale operations of this nature can provide alternatives to Canadian carriers for destinations located in Canada, the U.S., and overseas. Exhibit 1 depicts the option of using U.S.-based carriers for origination-destination points located in Canada as well as for the carriage of Canada-U.S. and Canada-Overseas traffic.

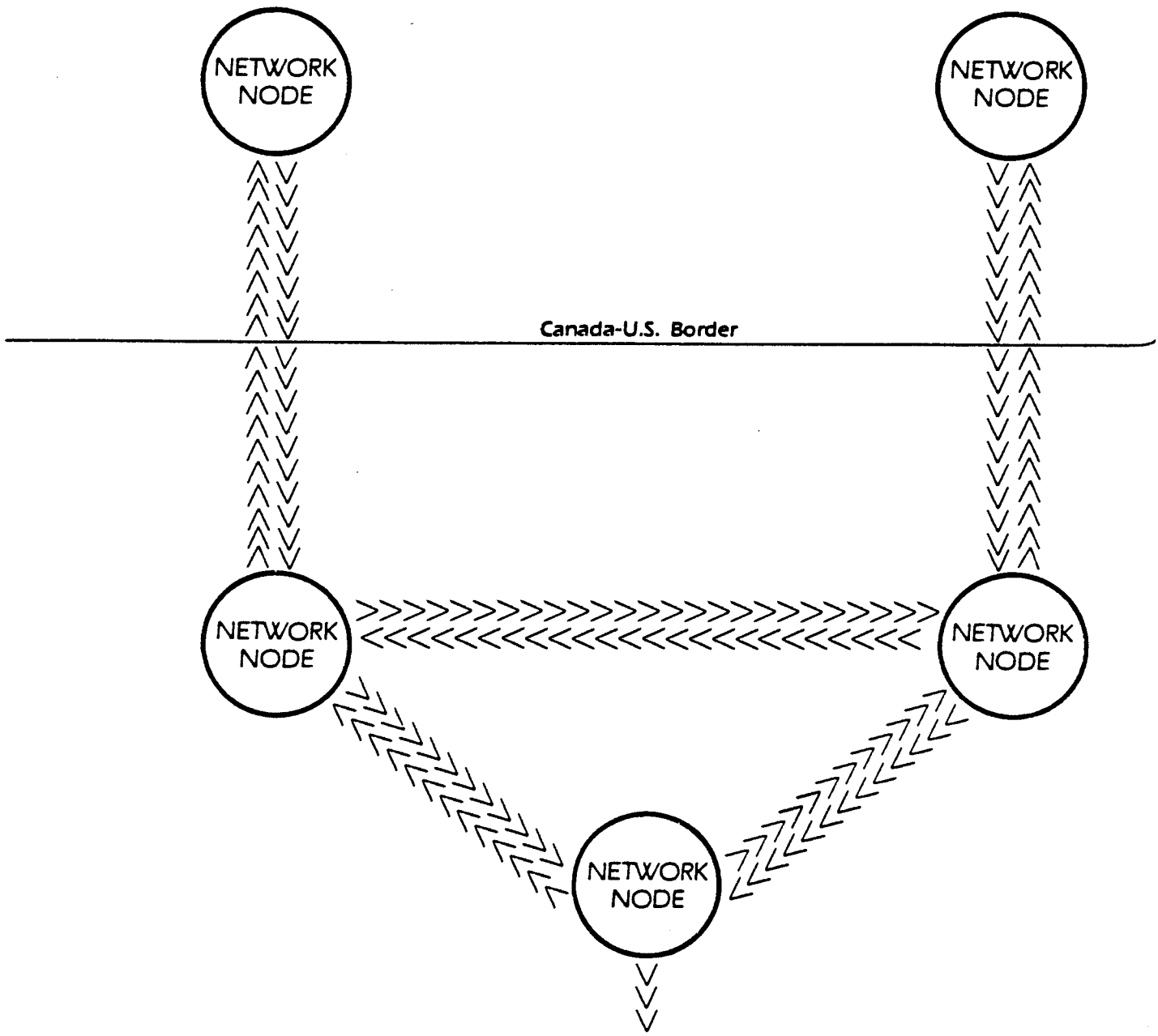
Additional services offered by these resellers include access by Canadian users to 800 Service provided in the U.S. only (that is, access to U.S.-based companies which subscribe to domestic 800 Service within the U.S. only, as opposed to the more expensive Canada-U.S. 800 Service).

Private Network Access to U.S. Competitive Services

A second major method of accessing U.S. competitive telecommunications services is through established Canada-U.S. private networks. Exhibit 2, overleaf, illustrates a typical cross-border network established to serve the intra-corporate telecommunications requirements of a large company. Such a network could have switching nodes in Canada, the U.S., and possibly overseas. A minimum network arrangement could include one node in Canada and one node in the U.S. A more complex arrangement could involve two or more nodes in Canada and two or more nodes located in the U.S. and elsewhere.

The various switching and transmission elements of such networks can be provided by Canadian and U.S. terrestrial and satellite carriers. The availability of satellite facilities leads to the possibility of direct access to U.S. satellite services from Canadian-based earth stations or indirect access by the use of cross-border terrestrial facilities to a U.S. access point.

Exhibit 2: Private Network Access to U.S. Telecommunications Services



The U.S. competitive situation permits two main alternatives which can affect the services otherwise provided by Canadian carriers:

- Off-ending into the local telephone network at a U.S. node in a private network or at the U.S. end of a tie-line (commonly referred to as the "leaky PBX");

- Accessing the services of U.S.-based domestic and international carriers at a U.S. node in a private network or at the U.S. end of a tie-line.

The possibility for Canada-Canada traffic being carried through the U.S. arises with a network having two nodes in Canada as illustrated in Exhibit 2. Double-border crossings of this nature, however, are prohibited by Canadian tariffs and policies.

Exhibit 3, overleaf, illustrates a private network arrangement which is designed to circumvent the border-crossing policies established by the major Canadian and U.S. carriers as part of their interconnecting agreements. The normal arrangement between Canadian and U.S. carriers is that the border crossing for provisioning purposes is the one (out of eleven designated border crossings) which is nearest the straight line joining the points of origination and termination of the private line. This is significant because, unlike message toll services which are billed on an end-to-end basis, private line services are billed by each carrier, Canadian and U.S., independently, and the distance to the border from the point of origination or termination is the basis for rating. Lower private line rates in the U.S., as discussed later in the chapter on telecommunications costs, provide an incentive for users to establish "dummy nodes" in the United States immediately adjacent to the established border crossing point nearest the Canadian origination point of the circuit, in order to maximize the use of U.S. facilities.

Exhibit 3: Alternate Private Line Arrangements

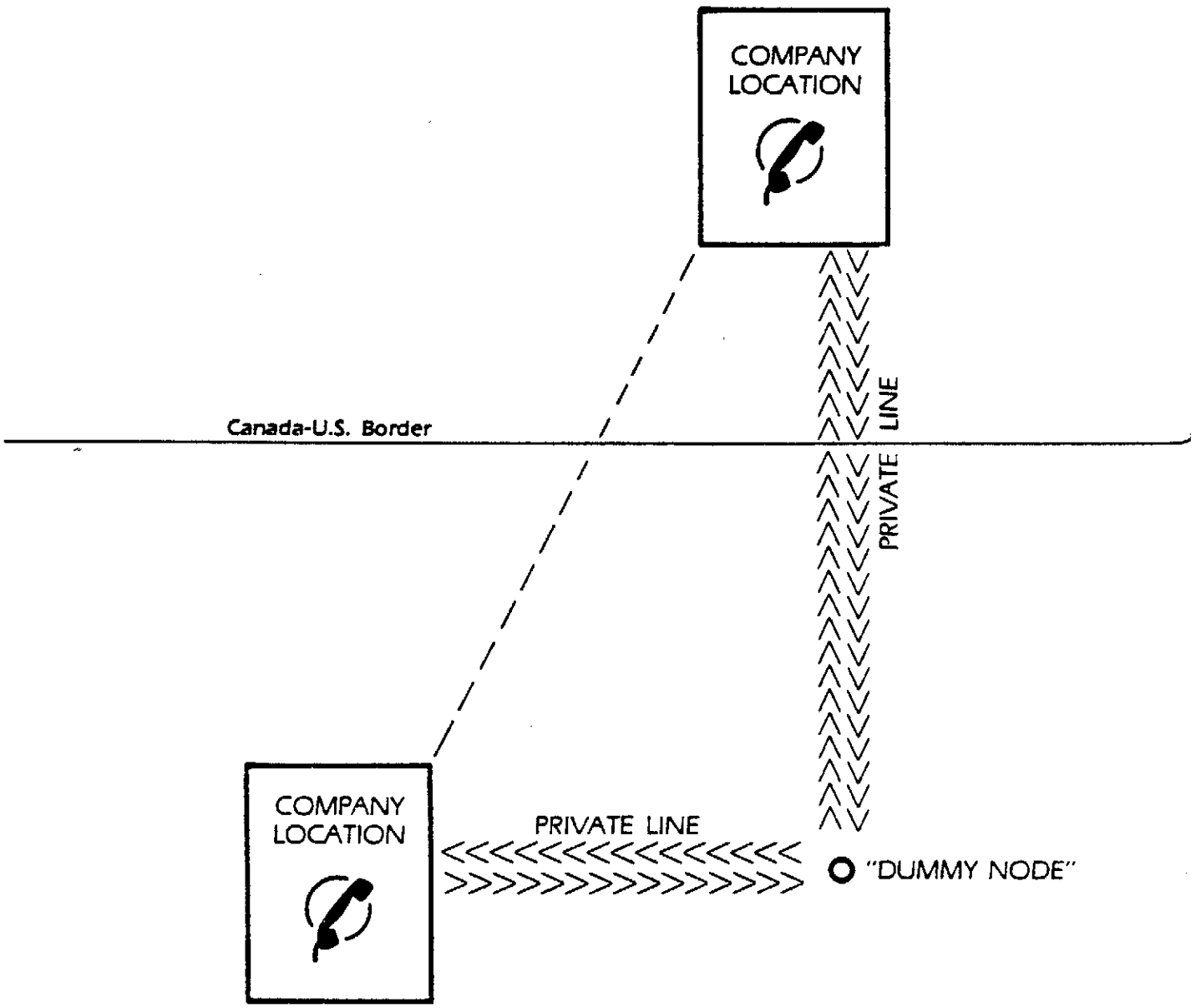


Exhibit 4, overleaf, shows a further variation on the private network arrangement in which a "dummy node" is expressly established in the U.S. as a point of presence to provide access to less expensive U.S.-based services. Such a "dummy node" would be established in the U.S. close to the nearest border crossing point. Since the purpose of the node is to provide access to U.S. services, it would not normally be located at a company business location. As illustrated, such a node could provide access to cheaper U.S. voice and data services, including U.S. long distance services, U.S. WATS services, and U.S. international (overseas) services.

Access to U.S.-Based Discount Message Service Providers

The third major area in which U.S. competition can have an impact on Canadian carriers is through user access to U.S.-based discount message service providers. This type of operation offers lower-priced and more technically varied alternatives for the completion of Telex and TWX messages to points in Canada, the U.S., and overseas. Exhibit 5, overleaf, illustrates this form of access. A wide variety of means of access to the facilities of the discount message service providers is available, ranging from the traditional Telex/TWX terminals, to readily available data communications terminals, or personal computers using packet switched and enhanced data services. The Canadian rates for Telex and TWX are sufficiently higher than those offered by the discount message service providers that the discount message service providers can locate relatively far from the border (in New York, for example) and still offer significant discounts. To give the service a universal appeal, the discount message service providers normally offer free access (the user ostensibly pays for only the delivered message). The pricing structure is also sufficiently different that it is possible to access international Telex in Europe and still obtain cheaper service.

THE ECONOMIC ASPECTS OF INTERNATIONAL COMPETITION

Whereas the previous section dealt with the technical ways in which access to international competition can be achieved, we examine in this section the economic factors which determine the

Exhibit 4: Private Line Access to U.S. Telecommunications Services

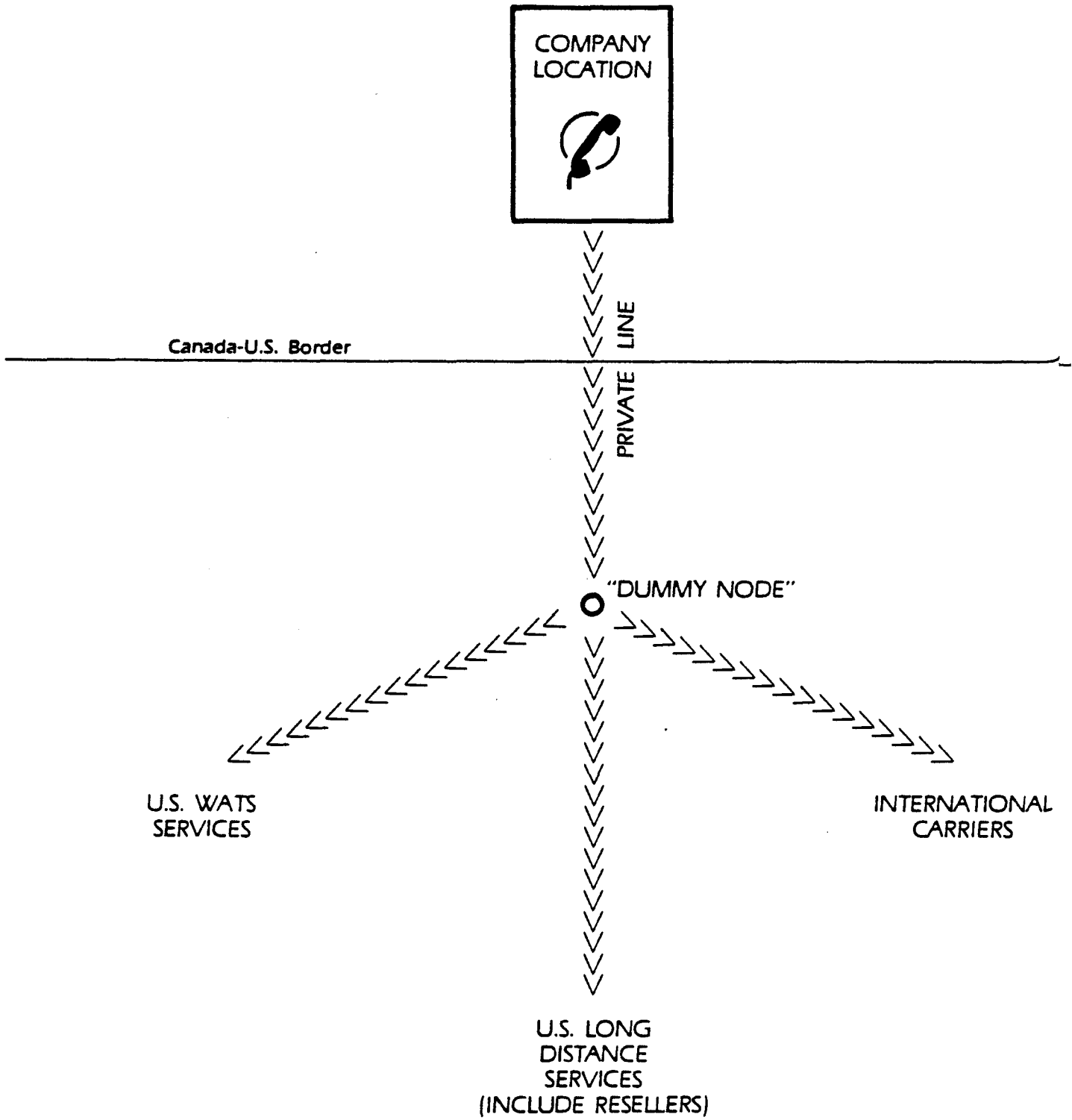
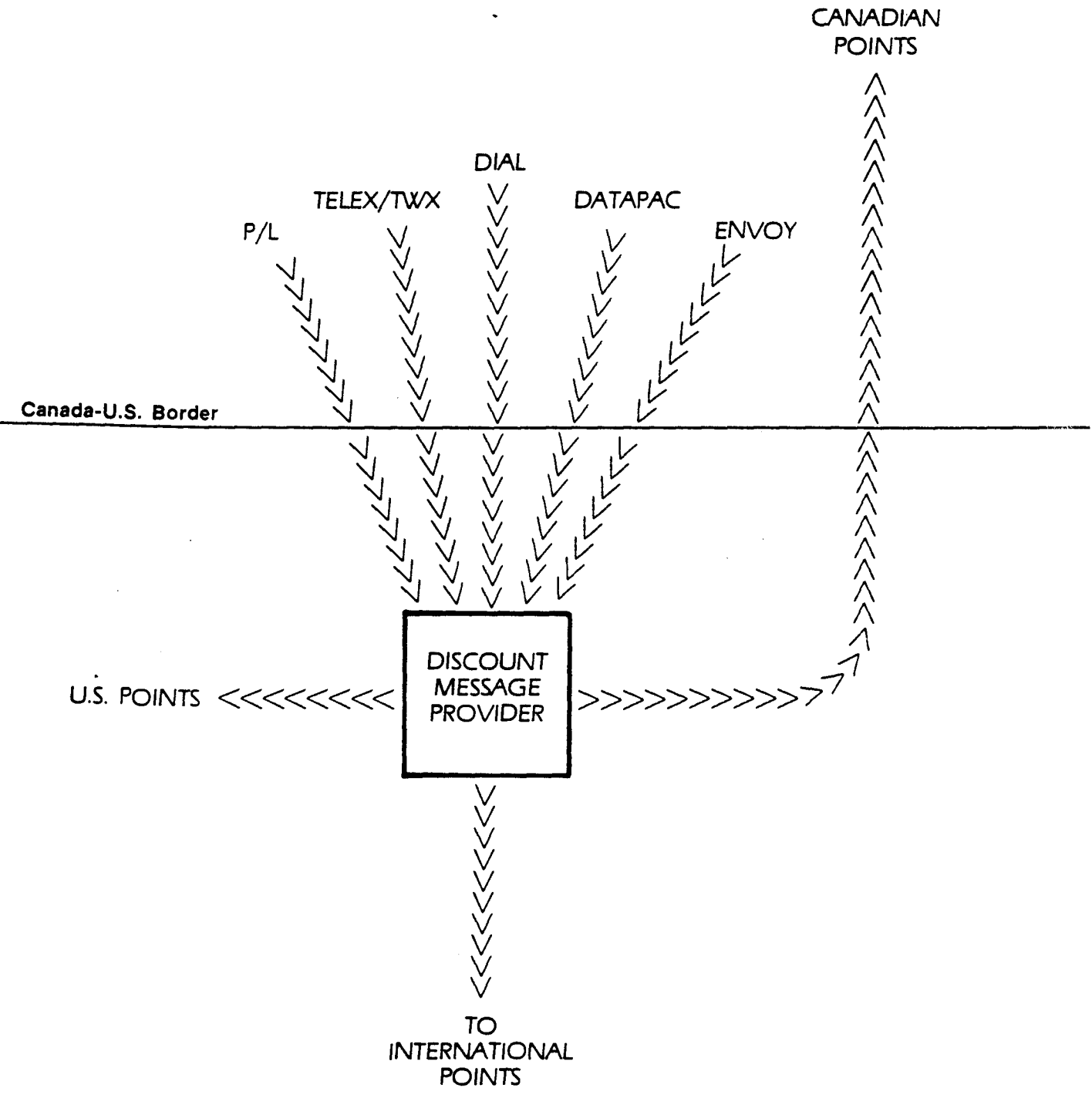


Exhibit 5: Access to U.S.-Based Discount Message Service Providers



actual impact or extent of such competition. Our analysis is based on the margins and financial incentives which exist between Canadian services and the U.S. competitive alternatives. It relies on an analysis of available tariff items and on general information gathered in the survey portion of this project.

The Economics of Cross-Border Resale

The economics of cross-border resale are dominated by the resale of long distance voice communications. The cross-border resale of data services is not of concern because there is a relatively small market for Canada-U.S. switched data services, and the margins available to resellers are small.

In determining the economic aspects of cross-border resale, costs were derived for completing Canada-Canada, Canada-U.S., and Canada-Overseas long distance calls from Toronto using conventional routings (Telecom Canada / AT&T / Teleglobe) and using non-conventional routings, including access to U.S. resellers (Allnet, American Network), Other Common Carriers (OCCs) such as MCI, and AT&T through short-haul toll, private line and "800" service. Sources of data for this analysis included the tariffed rates of Bell Canada and the rates in effect in the U.S. for domestic toll, U.S.-Canada toll and international toll.

Allnet was selected as one example of a U.S. reseller. It is large, well-established, and likely to survive the competitive pressures in the U.S. which may eventually cause the demise of many smaller resellers. Although Allnet's rates are not the lowest available, they are nevertheless taken as representing the long-term competitive threat from this type of resale which faces Canadian carriers. Allnet was also of particular interest since it was the first reseller to offer U.S.-originated call completion in Canada, thereby making possible Canada-Canada calls through the U.S. For comparison purposes, American Network was chosen as being representative of the lowest rates available. It should be noted that there is no evidence to indicate that either Allnet or American Network offers such a service to the Canadian market. Their rates are used only to illustrate the economics of cross-border resale.

AT&T and MCI were selected as alternative carriers for Canada-Overseas calls. AT&T represents the established, although now competitive, international carrier with arrangements to complete calls throughout the world. MCI represents the emerging new competitor in overseas calling, and currently provides services to approximately 30 countries.

Our analysis of the economics of resale is shown quantitatively in Exhibits 6 through 8, overleaf. These three exhibits present the economics of cross-border resale at exchange rates of 1.40 and 1.00 for three types of access. At the current exchange rate of approximately 1.40, the incentives to use resale services via dial and "800 service" access are negative or marginal, except for American Network on Canada-U.S. calls. In the case of private line access, the minutes of use per month required to justify the use of the private lines are prohibitively high except in the case of American Network. The exception regarding American Network reflects the lower rates they provide for calling within the U.S.

The situation changes dramatically at an exchange rate of 1.00. In all instances of dial and "800 service" access, the incentives are positive, sometimes significantly positive. Likewise, the situation is quite different with respect to private line access, the most dramatic change being the decrease in the number of minutes of use per month required to justify access to overseas services.

The major point of this discussion is that the current exchange rate acts as a deterrent to cross-border resale. If, however, Canadian and U.S. dollars were at par, large positive financial incentives to use cross-border resellers would exist and significantly more resale activity would be expected.

The Economics of Private Network Access to Competitive Services

The economics of using existing private networks to access competitive services is determined by incremental costs. Off-ending into local U.S. cities (the "leaky PBX") or gaining access to U.S. domestic or international carriers (Exhibit 2) costs little on an incremental basis. Furthermore, to complete calls

EXHIBIT 6: CROSS-BORDER RESALE USING DIAL ACCESS

(Rates in Cdn Dollars per 5 Minute Call - Exchange Rate 1.40)

From Toronto	Canada-Canada to Vancouver		Canada-U.S. to Los Angeles		Canada-Overseas to U.K.	
	Allnet	Am. Net.	Allnet	Am. Net.	AT&T	MCI
Access Cost	$1.28	$1.28	$1.28	$1.28	$1.28	$1.28
Reseller Charge	$5.47	$4.19	$3.02	$2.24	$9.03	$7.98
Total Cost	$6.75	$5.47	$4.30	$3.52	$10.31	$9.26
Telecom Canada Rate	$5.50	$5.50	$4.56	$4.56	$10.00	$10.00
Incentive	($1.25)	$0.03	$0.26	$1.04	($0.31)	$0.74

(Rates in Cdn Dollars per 5 Minute Call - Exchange Rate 1.00)

From Toronto	Canada-Canada to Vancouver		Canada-U.S. to Los Angeles		Canada-Overseas to U.K.	
	Allnet	Am. Net.	Allnet	Am. Net.	AT&T	MCI
Access Cost	$1.28	$1.28	$1.28	$1.28	$1.28	$1.28
Reseller Charge	$3.91	$2.99	$2.16	$1.60	$6.45	$5.70
Total Cost	$5.19	$4.27	$3.44	$2.88	$7.73	$6.98
Telecom Canada Rate	$5.50	$5.50	$4.56	$4.56	$10.00	$10.00
Incentive	$0.31	$1.23	$1.12	$1.68	$2.27	$3.02

EXHIBIT 7: CROSS-BORDER RESALE USING "800 SERVICE" ACCESS

(Rates in Cdn Dollars per 5 Minute Call - Exchange Rate 1.40)

From Toronto	Canada-Canada to Vancouver		Canada-U.S. to Los Angeles		Canada-Overseas to U.K.	
	Allnet	Am. Net.	Allnet	Am. Net.	AT&T	MCI
Access Cost	$1.59	$1.59	$1.59	$1.59	$1.59	$1.59
Reseller Charge	$5.47	$4.19	$3.02	$2.24	$9.03	$7.98
Total Cost	$7.07	$5.78	$4.62	$3.83	$10.62	$9.57
Telecom Canada Rate	$5.50	$5.50	$4.56	$4.56	$10.00	$10.00
Incentive	($1.57)	($0.28)	($0.06)	$0.73	($0.62)	$0.43

(Rates in Cdn Dollars per 5 Minute Call - Exchange Rate 1.00)

From Toronto	Canada-Canada to Vancouver		Canada-U.S. to Los Angeles		Canada-Overseas to U.K.	
	Allnet	Am. Net.	Allnet	Am. Net.	AT&T	MCI
Access Cost	$1.14	$1.14	$1.14	$1.14	$1.14	$1.14
Reseller Charge	$3.91	$2.99	$2.16	$1.60	$6.45	$5.70
Total Cost	$5.05	$4.13	$3.30	$2.74	$7.59	$6.84
Telecom Canada Rate	$5.50	$5.50	$4.56	$4.56	$10.00	$10.00
Incentive	$0.45	$1.37	$1.26	$1.82	$2.41	$3.16

EXHIBIT 8: CROSS-BORDER RESALE USING PRIVATE LINE ACCESS

(Rates in Cdn Dollars per 5 Minute Call - Exchange Rate 1.40)

From Toronto	Canada-Canada to Vancouver		Canada-U.S. to Los Angeles		Canada-Overseas to U.K.	
	Allnet	Am. Net.	Allnet	Am. Net.	AT&T	MCI
Cdn Portn $/Month	$869.00	$869.00	$869,00	$869.00	$869.00	$869.00
US Portion$/Month	$86.30	$86.30	$86.30	$86.30	$86.30	$86.30
Reseller Charge	$5.47	$4.19	$3.02	$2.24	$9.03	$7.98
Telecom Cda Rate	$5.50	$5.50	$4.56	$4.56	$10.00	$10.00
Brkevn Access Cost	$0.03	$1.31	$1.54	$2.32	$0.97	$2.02
Minutes of Use Req	183712	3635	3110	2059	4924	2365

(Rates in Cdn Dollars per 5 Minute Call - Exchange Rate 1.00)

From Toronto	Canada-Canada to Vancouver		Canada-U.S. to Los Angeles		Canada-Overseas to U.K.	
	Allnet	Am. Net.	Allnet	Am. Net.	AT&T	MCI
Cdn Portn $/Month	$869.00	$869.00	$869.00	$869.00	$869.00	$869.00
US Portion$/Month	$61.60	$61.60	$61.60	$61.60	$61.60	$61.60
Reseller Charge	$3.91	$2.99	$2.16	$1.60	$6.45	$5.70
Telecom Cda Rate	$5.50	$5.50	$4.56	$4.56	$10.00	$10.00
Brkevn Access Cost	$1.59	$2.51	$2.40	$2.96	$3.55	$4.30
Minutes of Use Req	2926	1854	1939	1572	1311	1082

from one Canadian point to another costs little for a network with established Canadian nodes. In fact, an artificial incentive can be created for the completion of Canada-Canada calls in this manner through the use of cost-averaging procedures throughout the network.

The economic incentives for creating "dummy nodes" in the U.S. for private voice or data communications networks in order to maximize the use of cheaper U.S. facilities (Exhibit 3) depend on the circumstances of particular users. In particular cases, the incentive to circumvent the established border crossing policy can be quite significant. The economics of establishing a "dummy node" in the U.S. for access to U.S. services (Exhibit 4) is similar to that of private line access to resellers. In particular, sufficient voice or data traffic must be available to justify the costs of the private line and the "dummy node".

Economics of Access to Discount Message Service Providers

The economics of access to discount Telex providers (Exhibit 5) are illustrated by selected statistics taken from information provided by Teleglobe Canada and Textran Technology, Inc. Exhibit 9, overleaf, presents current Teleglobe rates for Telex services to various countries compared to rates used by the discount message service providers. The comparison indicates that discounts of more than 50% are available in some cases. This confirms the information gathered from users that discounts of 25-50% were generally achieved by the use of discount message service providers rather than CNCP Telecommunications or Teleglobe.

Advertising information from a Canadian company, Textran Technology Inc., Montreal, and summarized in Exhibit 10, overleaf, illustrates the economics of access via Envoy.

A certain amount of Canada-Canada Telex traffic is carried by the discount message service providers independent of specific rate considerations. In cases where multiple address messages are sent, generally to overseas points, it is more convenient to send the message to all locations simultaneously than to separate

Exhibit 9: Selected Telex Rate Comparisons

(All rates in C$/Telex Minute)

Country or Region	Teleglobe Rates		Discount Message Service Providers	
	Real Time	Store & Forward	Telex Access	Dial Access
Europe (West)	$2.25	$1.75	$1.75	$1.25
Australia	$3.00	$3.00	$2.50	$2.00
Bahamas	$2.00	$2.00	$1.98	$1.48
Barbados	$2.00	$2.00	$2.40	$1.90
Brazil	$3.00	$3.00	$2.80	$2.30
Hong Kong	$3.00	$2.25	$2.00	$1.50
Israel	$3.00	$3.00	$1.98	$1.48
Japan	$3.00	$2.25	$2.00	$1.50
South Africa	$3.00	$3.00	$2.80	$2.30
South Korea	$3.00	$3.00	$2.80	$2.30
Taiwan	$3.00	$3.00	$2.80	$2.30
United Kingdom	$2.25	$1.50	$1.49	$0.99

Source: Teleglobe Canada (January 1986)

Exhibit 10: Selected Rate Comparisons
Telex with Envoy Access

(All rates in C$/Telex Minute)

Routing	CNCP/Teleglobe	Textran
Europe	2.45	1.99
Asia, Africa Australia S. America	3.27	2.74
Montreal to L.A. Vancouver to N.Y.	1.34	1.50
Mtl to Tor Hfx to Mtl	0.67	1.50

Source: Textran Brochure

Canadian addresses, even though it costs more. Thus convenience rather than specific rate considerations can govern the use of discount message service in respect of Canada-Canada Telex traffic.

FINDINGS REGARDING INTERNATIONAL COMPETITION

In this section, we document our findings with respect to the international competition aspects of this study.

Sources of Information

Information regarding the extent and nature of international competition came from three sources:

- Forty-four of the respondents in the survey of large business users.
- Resellers marketing their services in British Columbia and Quebec, including a former reseller.
- The major telecommunications carriers from across Canada.

It is worth noting that all the companies and individuals who were interviewed in the data gathering phase of this project were cooperative and forthcoming. Within the confines of the survey, we feel that a reasonably accurate picture of the extent of international competition has been obtained. The information from each of the three sources is summarized below.

International Competition in the Large Business User Community

As indicated earlier, the companies to be interviewed were chosen explicitly from the large business community across the country because of the anticipated propensity to use competitive alternatives available in the U.S. and elsewhere. In this respect, the companies for which information has been obtained

represent 44 of the largest Canadian companies across 27 industry sectors, many of which have extensive business dealings or company locations in the U.S. and around the world. Their business activities involve all regions of Canada, and they account for more than $400 million in annual expenditures on telecommunications facilities and services.

The results of the survey of business users can be summarized as follows:

- Dial access to resellers:
  - One company has one small division which uses the service for approximately ten calls per day.
  - One company tried the service but dropped it because of quality problems.

- Private line access to resellers:
  - One company uses this service.

- Access to discount Telex providers:
  - Five companies access discount Telex services in the U.S.
  - One company accesses international Telex in Europe.

- Off-ending from private networks or tie-lines:
  - 11 companies off-end in the U.S., generally involving only a small amount of their Canada-U.S. traffic.

- Access to U.S. WATS, MTS:
  - One company has a private line to access U.S. 800 services.
  - One company has a private line to the U.S. to access U.S.-Overseas MTS.
  - One company has private lines to the U.S. to access U.S. WATS services, and two other companies are conducting trials or considering this possibility.

- Direct access to U.S. satellite services:
  - One company has a private line to New York to access a satellite service.
  - One company is considering direct reception from U.S. satellites.

- Dummy data nodes to reduce private line costs:
  - One company has a node established.
  - One company is considering such a node.

- Canada-Canada traffic through the U.S.:
  - One company uses a private network mainly in the U.S. for a portion of its Canada-Canada traffic (the incentive is created by an artificially low cost allocation procedure carried out internally).

The above represents a very small amount of activity compared to what could be occurring in view of the extent of the U.S. and overseas business dealings of these major telecommunications users, and in view of the lower U.S. rates. In particular, it is to be noted that there is very little access to cross-border resellers. Almost all long distance voice services and all data services are provided by the established Canadian carriers. Access to discount Telex providers is more prevalent because of the larger discounts available.

The following reasons were given for not accessing U.S. competitive services:

- Against company policy since it would contravene Canadian telecommunications regulations or policies (this was by far the predominant reason).

- Resellers represent an unknown quantity to whom a critical aspect of business cannot be given.

- It would harm the company's image to contravene Canadian telecommunications policy.

- It would harm the Canadian economy by diverting revenues to the U.S.

- Volumes of traffic do not justify the expense of time and equipment.

- Not aware of the possibility, or service not offered.

In virtually every case, the reason given for accessing U.S. competitive services was to reduce company expenditures. In other words, the incentives were overwhelmingly economic in nature. This reason was significant to telecommunications managers, for whom the cost savings to be obtained were a significant portion of the telecommunications budget. It was, however, a minor factor for senior executives who were interviewed, since the cost savings to be achieved were then judged in the perspective of overall company expenditures, in which perspective they are much smaller. For the companies interviewed, total telecommunications expenditures represented a relatively small share of total purchased inputs, ranging from a low of 0.7 percent to a high of 11.9 percent.

Resellers' Activities

Interviews were held with the cross-border resellers known to be currently actively marketing U.S. services in Canada, namely:

- Cam-Net Communications Inc. (Cam-Net).

- Longnet Communications Inc. (Longnet).

- American International Telecommunications (AIT).

Cam-Net and Longnet market their services to B.C. Tel subscribers in southern British Columbia, while AIT offers service to Bell Canada subscribers in Montreal. We also interviewed a former reseller whose business interests in a resale operation providing service to clients in Toronto and

Montreal had been sold, with subsequent discontinuance of service to clients in Montreal. Information from these resellers was as follows:

- B.C. Tel's Canada-U.S. message toll rate restructuring of 1985 has curtailed reseller revenues to a significant extent from southern British Columbia.

- Only dial access is provided from British Columbia.

- Access to U.S. 800 services is offered in British Columbia.

- Discounts of approximately 15% on average are offered on main routes.

- Traffic carried by AIT from Montreal during the first six months of 1985 totaled C$47,000, and in none of these months did revenues exceed C$11,000.

- Both dial access and private line access services are provided to Montreal clients.

- To justify private line access from Montreal, approximately C$3-4,000 per month in Canada-U.S. calling is required.

- The resellers indicated that resale activities were occurring in Toronto, but gave no tangible evidence. (We also found no tangible evidence from the user survey).

- The resellers stated that they offer only Canada-U.S. and, to a limited extent, Canada-Overseas services, and that they do not provide Canada-Canada services.

International Competition from the Carriers' Perspectives

Information on the occurrence of international competition in the user and reseller communities was supplemented by interviews with the major Canadian telecommunications carriers. Included in these interviews were:

- The member companies of Telecom Canada
- Telecom Canada central staff
- CNCP Telecommunications
- Teleglobe Canada

The findings in respect of the carriers can be summarized as follows:

- Access to U.S. competitive services is considered a serious threat, but is currently relatively low in magnitude.
- The restructuring of Canada-U.S. MTS rates has been an effective means of curtailing the growth in dial access to cross-border resellers.
- Most major population centers are too far from the U.S. border for significant terrestrial access to U.S. long distance services (existing activity is concentrated in southern B.C., Ontario and Quebec).
- Potential direct access to U.S. satellites is a concern.
- Access to discount Telex providers is of increasing concern.

Assessment of the Extent of International Competition

Considering the evidence available from all sources, including some provided to us on a confidential basis, we estimate the extent of international competition as follows:

- Revenue loss from Canadian carriers to cross-border resellers is not more than C$1.5 million per year.

- The revenue loss to discount Telex providers is approximately C$3.1 million per year.

No estimates are possible of the revenue loss to Canadian carriers due to users off-ending from private lines or private networks in the United States (the "leaky PBX"), or due to the use of "dummy nodes" to reduce private line costs.

FORECAST OF EXTENT OF INTERNATIONAL COMPETITION

In forecasting the future extent of international competition, we have chosen to focus attention on the two areas which appear to be driven by the rate differentials between Canadian and U.S. telecommunications services, namely cross-border resale and access to discount Telex providers. As noted earlier, access to U.S. competitive services is curtailed by company policies, and appears to be limited in extent. We would expect this situation to continue unless very substantial incentives develop as a result of changes in either Canadian or U.S. telecommunications rate structures, or in the Canada-U.S. exchange rate.

Economic Analysis of Future International Competition

Our basic forecast of the extent of international competition over the next five years was developed using the indicators of economic activity from the Informetrica forecasting

model (TIM). The use of this model is discussed more fully in the following chapter on telecommunications costs. In essence, we used the current extent of international competition discussed in the previous section and determined a forecast based on predicted changes in the Canadian economy.

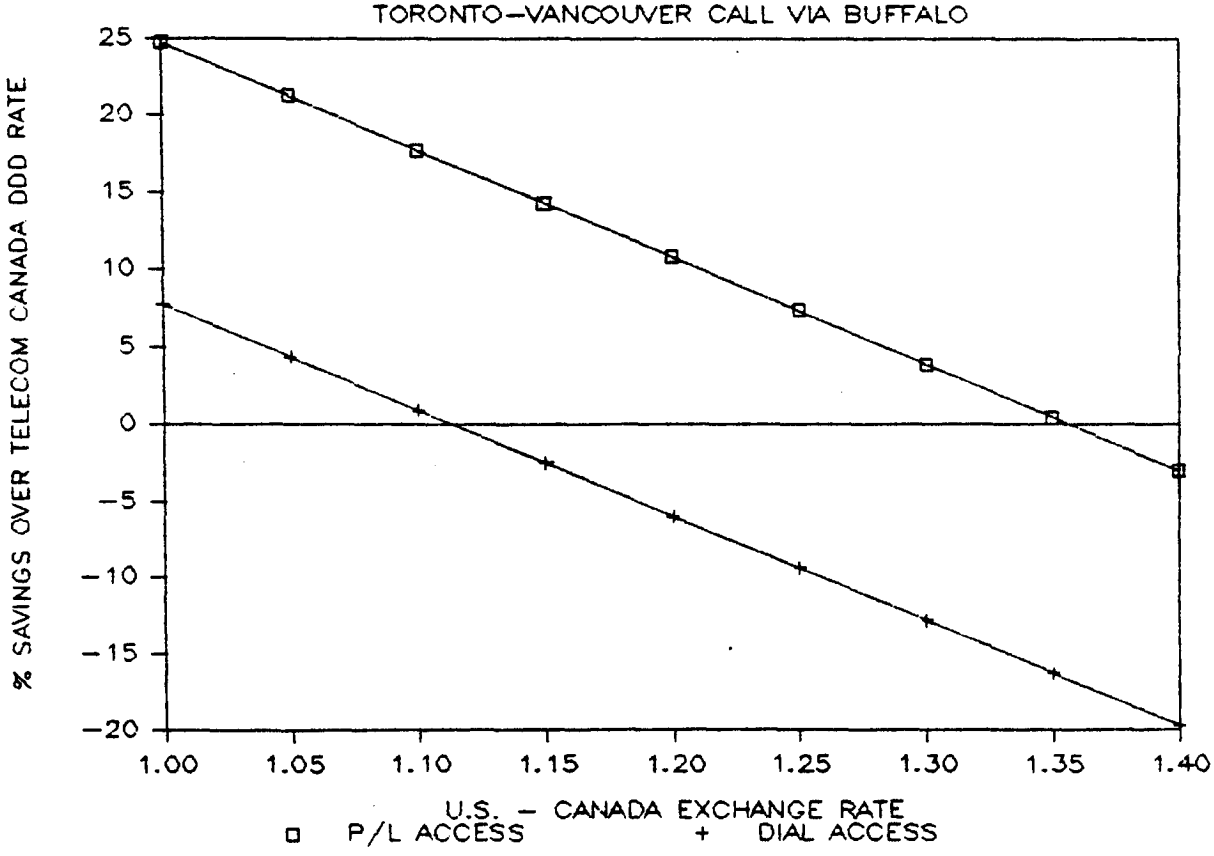
One of the important changing factors which is accounted for in the model is the Canada-U.S. exchange rate. The exchange rate plays a major role in determining Canadian use of competitive U.S. services since it establishes the effective rate Canadians will pay. To illustrate, we present in Exhibit 11, overleaf, the effect of the exchange rate on the incentive to use the services of a cross-border reseller for a long distance call from Toronto to Vancouver. The basic data for the calculations is taken from Exhibits 6 and 8. The incentive to use this service becomes positive at exchange rates of 1.35 and 1.12 for private line access and dial access, respectively. That is, it becomes less expensive at these exchange rates to use the services of cross-border resellers than to use the services of Canadian carriers. This analysis is based on Bell Canada, Telecom Canada and AT&T rates, as appropriate. In this exercise, we have assumed maximum private line utilization of 228 hours per month, or about 10 hours per business day, in order to minimize the cost of access.

In our estimation, Canadian business users will not change their telecommunications purchasing decisions significantly unless an incentive greater than 10 percent is available. An incentive exceeding 10 percent is required, in our view, to overcome the lower quality of service and inconvenience resulting from having to make two calls in order to complete one. From the information in Exhibit 11, this would occur at exchange rates lower than 1.20 for private line access, and not at all for dial access. This assumption on purchasing has been included in our analysis. It does not, however, affect the forecast of the extent of international competition in this case since the predicted values of the exchange rate provided by Informetrica do not drop below 1.25 over the next five years.

A dependence on the exchange rate does not occur for access to discount Telex providers. In this case, the discounts available to Canadian users are already so significant (25-50%) that exchange rate variations within the expected range are of

EXHIBIT 11

TORONTO–VANCOUVER CALL VIA BUFFALO



little consequence. Furthermore, lack of convenience is not an issue in the case of Telex services. Discount Telex service providers offer the convenience of reaching a Telex subscriber anywhere in the world from both Telex and non-Telex terminals.

Using the Informetrica reference forecast for Canadian GDP as an indicator of the expected growth in economic activity, we would expect that in the absence of significant changes in rates for telecommunications services and in the absence of significant changes in the Canada-U.S. exchange rate, the extent of international competition would have an impact on voice service revenues of up to C$1.8 million annually by 1990. Similarly, the expected revenue impact of international competition on Telex revenues would increase to approximately C$3.7 million annually.

Other Factors Affecting the Future Extent of International Competition

The sharing and resale of telecommunications facilities and services approved in Telecom Decision CRTC 85-19 could increase the use of U.S. competitive services. Sharing and resale could result in cheaper private line access and bring the availability of cross-border resale services to a wider range of Canadian businesses. How changes in the regulations for sharing and resale will actually affect the cost of access cannot be determined since associated tariff changes filed with the CRTC have not yet been approved.

ASSESSMENT OF THE IMPACT OF INTERNATIONAL COMPETITION

The revenue impact of international competition is felt by all Telecom Canada members (excluding Telesat Canada), by CNCP Telecommunications, and by Teleglobe Canada. In the case of access to cross-border resellers, the impact is on each Telecom Canada member (except for Telesat Canada) and, where overseas traffic is involved, on Teleglobe Canada. Even though resale activity is taking place only in the provinces served by Bell Canada and B.C. Tel, all Telecom Canada members (excluding Telesat) are affected by virtue of their revenue settlement

arrangements. By agreement, the net revenues from all Canada-U.S. and Canada-Overseas calls are shared among members using the Revenue Settlement Plan (RSP).

We present in Exhibit 12, opposite, the estimated loss in revenue experienced by each of the Telecom Canada members other than Telesat. The amount for each member is determined in proportion to the percentage of Telecom Canada settled revenues. The percentage shares of settled revenues used in this calculation were obtained from the publicly available data in the CRTC proceeding "Bell Canada and B.C. Tel: Increases and Decreases in Rates for Services Provided on a Canada-Wide Basis and Related Matters". While these were percentages in effect in 1979, more recent figures for all nine Telecom Canada members are not publicly available. However, in the view of Telecom Canada central staff, these percentages are sufficiently representative of the current situation to estimate the first order impact. A more precise estimate would involve detailed modeling of the RSP using revised input data.

It is assumed that the full impact on net originated revenues of $1.5 million translates directly to settled revenues since associated underlying costs which would have been incurred in earning these revenues still remain.

Telecom Canada members are affected in two other ways by cross-border resale. The first way relates to the nature of the revenue settlement with AT&T. The second relates to the settlement category of private lines.

The settlement process with the U.S. is an "accounting rate" settlement, under which each of AT&T and the Telecom Canada members (jointly) receive a flat rate of US$0.21 per minute for terminating traffic originated by the other, regardless of the points of origination or termination. The "collection rates", or rates charged by the originating carrier to the subscriber placing or accepting the charges for the call, are, of course, dependent on the points of origination and termination. Canada-U.S. and Canada-Overseas calls which are carried on the facilities of resellers are short-haul in nature from the point of view of the originating Canadian carrier, and consequently

Exhibit 12: Revenue Impact of Current Cross-Border Resale

Telecom Canada Member	% Share of Settled Revenues	Settled Revenue Loss $(000)
B.C. Tel	15.6	234
Alberta Govt Tel	13.5	203
SaskTel	5.0	75
Manitoba Tel Syst	5.0	75
Bell Canada	48.4	726
NB Tel	3.3	50
MT&T	4.7	71
Island Tel	1.0	15
Nfld Tel	3.5	53

generate little revenue compared to the revenue which would be generated if the entire call were completed as a conventional DDD call.

In the case of access by private lines, the effect is to shift long distance revenues from the Telecom Canada settlement category. As discussed in the following chapter on telecommunications costs, Canada-U.S. private line services are billed to the user separately by each of the Canadian and U.S. carriers. Canada-U.S. private line services are not classed as Telecom Canada services, and the revenues are not subject to settlement through the RSP, unless two Telecom Canada members and a U.S. carrier are involved in providing the service. In the case of access to cross-border resellers, only one Telecom Canada member would be involved, and the impact on individual Telecom Canada members not involved in originating the traffic could be even greater.

The revenues of Teleglobe Canada are reduced by diversion of overseas long distance traffic through cross-border resellers and U.S.-based international carriers. No information was available to permit an estimate of the actual extent of this revenue loss. It would appear from our discussions with users and resellers that the amount of overseas traffic carried in this fashion is minimal. The bulk of the activity centers around Canada-U.S. calling. For this reason, we feel that the current impact of international competition in long distance services on Teleglobe Canada is negligible. However, U.S.-overseas message toll rates have recently been declining much faster than U.S. domestic message toll rates, and this could create additional incentives for Canadian users to access U.S.-based international toll carriers.

We have previously indicated the total impact of lost Telex revenues to be approximately C$3.1 million annually, with Teleglobe experiencing a loss of approximately $1.5 million, and CNCP a loss of approximately $1.6 million. Whereas overseas Telex messages which originate with CNCP are carried by Teleglobe, the estimates provided above relate to the net revenue losses and hence take this factor into account. Telecom Canada

members benefit to some extent from the use of discount Telex providers, since new traffic is generated for them through access by their dial, packet switched and value-added services.

The impact of international competition on Telesat Canada is not considered to be significant. While direct access to U.S. satellites from Canadian-based earth stations is a possibility, and while at least one company has a terrestrial private line to the U.S. to access U.S. satellite services, this does not mean that Telesat Canada has incurred a loss in revenues as a result. In the case of the company accessing U.S. satellite services through a terrestrial private line from Canada, the conventional routing from Canada would be via either Telecom Canada or CNCP, with Teleglobe Canada completing the circuit through its international arrangements. We did not encounter any firms accessing U.S. satellites directly from Canada.

TELECOMMUNICATIONS COSTS

In this chapter of the report, we describe that segment of the study leading up to the examination of the impact of substituting U.S. telecommunications rates for Canadian rates. The chapter begins with an introduction to this part of the study, provides details of the rate comparison procedure, and discusses the significance of the exchange rate in making the comparison of Canadian and U.S. rates. The impact analysis is described in the following chapter.

INTRODUCTION

This part of the study responds to the requirement in the terms of reference for a determination of the impact of the current pricing structure differential between Canadian and U.S. long distance telecommunications services on the competitive ability of Canadian business users and the attractiveness of Canada as a location for business activity.

In our proposal, we argued that such an impact should be determined in the context of total telecommunications expenditures, not just expenditures on long distance telecommunications services. This proposal was accepted by the sponsors of the study, and formed the basis for the methodology in this part of the study.

As explained in detail in the introductory chapter of this report, the objective was to investigate the impact of substituting U.S. tariffed rates for Canadian tariffed rates for comparable services. In terms of the Informetrica economic model used for the impact assessment, this constituted the use of a price change for telecommunications costs. The magnitude of the price change had to take into account the mix of services used by each industry sector as well as the fact that not all telecommunications services are tariffed.

It should be emphasized that the price change was imposed as a change in telecommunications costs for all business users, in proportion to the mix of services they use and the appropriate ratio of U.S. to Canadian rates for that mix of services.

However, we did not make any provision in the model for imposing corresponding increases in telecommunications costs on any other sector of the economy, nor did we assume that increases in demand for services would cover the shortfall in the revenue requirements of the telecommunications carriers.

It is also important to emphasize that the study did not involve the substitution of other aspects of the U.S. telecommunications industry, such as the regulatory environment or competitive environment for telecommunications services. Neither did it take into account the potential impact on the Canadian telecommunications industry of the price changes calculated. The Canadian telecommunications carriers are assumed to be unaffected by such a change in price. Finally, while the study took into account the impact of changing prices for the mix of services used by various industry segments, it did not estimate the impact of changing prices on the mix of services. Such an estimate was not within the terms of reference; furthermore, it would require extensive information on elasticities of demand and cross-elasticities of demand, information which to our knowledge is not available. However, it became very apparent from our interviews with major users that in many cases the mix of services is a direct result of existing tariffed rates; any change in rates, particularly in the relative rates for interexchange services, would result in an immediate change in the mix of services in order to minimize costs.

Approach to the Collection of the Data

Given the requirement for detailed information on the mix of telecommunications services in this methodology, personal interviews were necessary. However, limitations in both budget and schedule meant that detailed information could be obtained from a limited number of companies. Using the Statistics Canada Input-Output Table, we determined those industry segments which were major users of telecommunications services, and also those segments for which the expenditure on telecommunications services was a significant input cost relative to other input costs. We developed a ranking of industry sectors based on both these factors, and chose the most significant sectors. In other words,

we focused on those industry segments for which both the absolute magnitude and relative importance of telecommunications costs were significant.

Selection of the Interview Sample

Having identified those industry sectors which were important, we next selected a number of firms within each of the industry sectors, taking into account the range of firms within the sector, the size of the sector and the fact that the study was also intended to examine the question of international competition. This latter point is significant because it means the sample was designed to include the large users of telecommunications services, and was therefore not designed to be representative of all firms or industry sectors. The proposed list of firms was reviewed with the client group. On this basis, the final list of some fifty large companies was determined.

Data Collection

In order to meet the detailed data requirements of the methodology developed for the study, we requested annual expenditure data broken down into major service categories. For example, message toll expenditures were requested as Canada-Canada, Canada-U.S. and Canada-overseas.

In order to assess the impact on the competitive position of the firm, the significance of telecommunications costs in relation to other purchased inputs was examined. In addition, the significance of telecommunications costs in determining where jobs or operations are located was discussed.

The study did benefit from what we consider to be a high response rate given the detailed information required. Unfortunately, a few firms were not able to meet with us or to provide the detailed information within the required timeframe. Nevertheless, detailed annual telecommunications expenditure data was obtained for 40 major users of telecommunications services across Canada, representing, in total, annual expenditures of approximately $400 million.

It was also apparent that many industrial sectors are composed primarily of small and medium sized businesses, businesses whose mix of telecommunications services is different from larger firms. For this reason, we also conducted a telephone survey of approximately 40 small and medium sized businesses from a wide variety of business sectors in the Ottawa area.

Finally, we requested the telecommunications carriers to provide us with profiles of typical small, medium and large users.

Mix of Telecommunications Services

The data on telecommunications expenditures by individual firms, large, medium and small, was accepted on a confidential basis. The overall mix of services used by the combination of businesses sampled is provided in Exhibit 13, opposite. Some firms had difficulty separating the cost of access lines from the cost of terminal equipment leased from the carriers, because their accounting systems did not provide the appropriate level of detail. In these cases, both terminal equipment - telco lease and access lines are considered to be elements of local service costs and are included in the category "telco lease".

In order to determine the ratio of U.S. to Canadian telecommunications costs for input to the economic model, the individual ratios for each of the service categories in Exhibit 13 had to be determined. We did this by selecting comparable services offered by U.S.-based telecommunications carriers, and then developing a reasonable basis of cost comparison using the details provided in the tariffs as well as other usage information provided by carriers and users. Except where noted, the tariffs used were those indicated as being in effect on January 1, 1986. This process is described in the following section.

EXHIBIT 13: MIX OF SERVICES FOR COMPANIES SURVEYED

SERVICE		ANNUAL EXPENDITURES $(000) SMALL BUSINESS	TOTAL SAMPLE	SAMPLE PERCENT
MESSAGE TOLL	CANADA - CANADA	7.4	44510.5	11.2
	CANADA - U.S.	0.9	5512.6	1.4
	CANADA - OVERSEAS	0.4	2550.3	0.6
WATS	INTRA-PROVINCIAL	2.2	12962.2	3.3
	INTER-PROVINCIAL		9576.0	2.4
"800" SERVICE	CANADA - CANADA		16888.1	4.2
	CANADA - U.S.		302.7	0.1
TOTAL TOLL SERVICES		10.9	92302.3	23.2
PRIVATE LINES - VOICE				
	CANADA - CANADA	2.0	18701.2	4.7
	CANADA - U.S.		2999.5	0.8
	CANADA - OVERSEAS		15.6	.0
TELPAK				
	CANADA - CANADA		11263.1	2.8
	CANADA - U.S.		6007.1	1.5
	CANADA - OVERSEAS		0.0	0.0
TOTAL PRIVATE LINE VOICE		2.0	38986.6	9.8
PRIVATE LINES - DATA				
	CANADA - CANADA		57816.2	14.5
	CANADA - U.S.		3109.0	0.8
	CANADA - OVERSEAS		3309.0	0.8
TOTAL PRIVATE LINE DATA		0.0	64234.2	16.1
LOCAL SERVICE COSTS - VOICE				
TERMINAL EQUIPMENT				
- TELCO LEASE		2.6	76479.9	19.2
- THIRD PARTY LEASE			3965.0	1.0
- CUST. OWNED AND MAINTAINED			5888.0	1.5
CENTRAL OFFICE ACCESS LINES		3.8	28398.0	7.1
LOCAL SERVICE COSTS - DATA				
TERMINAL EQUIPMENT				
- TELCO LEASE			10550.6	2.7
- THIRD PARTY LEASE			3011.2	0.8
- CUST. OWNED AND MAINTAINED			4004.0	1.0
CENTRAL OFFICE ACCESS LINES			165.2	.0
INTRAEXCHANGE H/S DATA LINES			429.9	0.1
TOTAL LOCAL SERVICE COSTS		6.4	132891.8	33.4
SWITCHED DATA				
TELEX OR TWX -	CANADA - CANADA		3345.5	0.8
	CANADA - U.S.		494.1	0.1
	CANADA - OVERSEAS		1113.2	0.3
PACKET SWITCHED -	CANADA - CANADA		3651.0	0.9
	CANADA - U.S.		0.0	0.0
	CANADA - OVERSEAS		171.0	0.0
TOTAL SWITCHED DATA		0.0	8774.9	2.2
SATELLITE SERVICES			12000.0	3.0
SPECIAL ASSEMBLIES & NON-TARIFFED SERVICES			48757.0	12.3
TOTAL TELECOM COSTS		19.3	397946.8	100.0

CANADA-U.S. RATE COMPARISONS

The services for which rate comparisons were required were as follows:

- Message toll - Canada-Canada
  - Canada-U.S.
  - Canada-Overseas
- WATS service
- "800" service - Canada-Canada
  - Canada-U.S.
- Private lines (voice) - Canada-Canada
  - Canada-U.S.
- Telpak - Canada-Canada
  - Canada-U.S.
- Private lines (data) - Canada-Canada
  - Canada-U.S.
  - Canada-Overseas
- Local service costs (voice and data)
- Telex or TWX - Canada-Canada
  - Canada-U.S.
  - Canada-Overseas
- Packet switched data - Canada-Canada
- Satellite services

The detailed rate comparison for each of these services is described in the following sections of the report.

Message Toll Service

For large businesses, the comparison of message toll service rates was based on an average of rates for 300, 1200 and 2000 mile calls in each of Canada and the U.S. For Canada, the 300 mile rate was a composite of the Bell (Ontario-Quebec) message toll tariff and the Telecom Canada tariff, while the 1200 and 2000 mile rates were Telecom Canada rates. The U.S. rates were a composite of 80% AT&T, 12% MCI, 4% GTE Sprint and 4% Allnet, reflecting the approximate market shares in the interstate market. Allnet was used as an example of a "pure reseller". The appropriate volume discounts for MCI, GTE Sprint and Allnet were taken into account. The ratio of the rate in U.S. dollars for the mix of U.S. services to the rate in Canadian dollars for the mix of Canadian services was 0.45. This number does not include an adjustment for the Canada-U.S. exchange rate. The exchange rate is discussed later.

For small and medium sized businesses, information obtained during the telephone survey indicated that they tended to use a larger proportion of short-haul toll. In order to take this into account, along with the fact that some firms in the sample also use long-haul toll, the mix of toll used was 50% 300-mile calls (on the composite basis described above), and 50% 2000-mile calls. The ratio of the U.S. to Canadian rate determined on this basis was 0.47. It can be argued that small and medium sized businesses use, on average, a larger percentage of very short-haul toll, although this percentage will vary from region to region. If this were the case, the ratio would be numerically larger (i.e. closer to 1.00), since Canadian short-haul toll rates are lower than U.S. short haul toll rates for interexchange distances of less than 150 miles.

Further information on comparisons of U.S. and Canadian message toll rates is available from the tariffs of the resellers and facilities-based carriers used to prepare the analysis of the economics of the U.S. reseller industry (Appendix A). The comparative data from these tariffs has been converted to the corresponding Telecom Canada mileage band, and the U.S. rates have been converted to rates in Canadian dollars at an exchange rate of 1.40. The comparison of these rates is provided in Exhibit 14, overleaf.

Exhibit 14 : Cost for a 5-Minute Daytime DDD Call (Exchange Rate 1.40)

Mileage Band	Telecom Canada	AT&T	Allnet	American Network	Am. Tel. Exchange	Commun. Co. of America	Eastern	Entel	Florida Long Distance	GTE Sprint	MCI
0-8	0.70	1.51	1.19	0.49	0.42	1.34	1.34	1.14	1.26	1.46	1.27
9-20	0.94	1.95	1.60	0.98	0.91	1.78	1.79	1.52	1.71	1.89	1.64
21-36	1.25	2.24	1.96	1.47	1.19	2.00	2.24	1.90	2.09	2.19	2.01
37-56	1.63	2.24	1.96	1.47	1.68	2.00	2.24	1.90	2.09	2.19	2.01
57-80	2.01	2.56	2.26	1.82	1.82	2.32	2.87	2.44	2.72	2.46	2.32
81-110	2.31	2.56	2.26	1.82	1.96	2.32	2.87	2.44	2.72	2.46	2.32
111-144	2.65	2.67	2.37	2.10	2.03	2.44	3.00	2.44	2.83	2.53	2.45
145-180	2.98	2.67	2.37	2.10	2.03	2.44	3.00	2.54	2.83	2.53	2.45
181-228	3.32	2.67	2.37	2.17	2.10	2.44	3.00	2.54	2.83	2.53	2.45
229-290	3.61	2.67	2.37	2.17	2.10	2.44	3.00	2.54	2.83	2.53	2.45
291-400	3.95	2.80	2.54	2.24	2.31	2.51	3.18	2.70	2.95	2.65	2.66
401-540	4.25	2.90	2.63	2.24	2.73	2.60	3.28	2.78	3.05	2.70	2.75
541-680	4.50	2.90	2.63	2.24	2.73	2.60	3.28	2.78	3.05	2.70	2.75
681-920	4.80	2.90	2.63	2.24	2.73	2.60	3.28	2.78	3.05	2.70	2.75
921-1200	5.00	2.97	2.70	2.24	2.73	2.66	3.36	2.86	3.14	2.77	2.85
1201-1450	5.20	2.97	2.70	2.24	2.73	2.66	3.36	2.86	3.14	2.77	2.85
1451-1675	5.35	2.97	2.70	2.24	2.73	2.66	3.36	2.86	3.14	2.77	2.85
1676-over	5.50	3.26	2.92	2.24	2.73	2.95	3.78	3.21	3.54	3.04	3.07

Mileage Band	Telecom Canada	North American Network I	Telephone	RCI	Starcom	Teltec	Thrifty Telephone Exchange	U.S. Tel	Westel Exchange	Western Union
0-8	0.70	0.71	0.66	1.05	2.45	0.99	0.35	1.25	0.84	1.57
9-20	0.94	1.16	1.09	1.39	2.45	1.32	0.70	1.63	0.84	1.57
21-36	1.25	1.81	1.71	1.81	2.45	1.78	1.12	1.99	1.05	1.85
37-56	1.63	1.70	1.86	1.81	2.45	1.78	1.61	1.99	1.05	1.85
57-80	2.01	2.37	2.49	2.32	2.45	2.26	1.75	2.31	1.54	2.30
81-110	2.31	2.37	2.49	2.32	2.45	2.26	1.89	2.31	1.54	2.30
111-144	2.65	2.40	2.55	2.44	2.45	2.40	1.96	2.43	1.61	2.44
145-180	2.98	2.40	2.55	2.44	2.45	2.40	1.96	2.43	1.61	2.44
181-228	3.32	2.55	2.57	2.44	2.45	2.40	2.03	2.43	1.75	2.44
229-290	3.61	2.55	2.57	2.44	2.45	2.40	2.03	2.43	1.75	2.44
291-400	3.95	2.86	2.67	2.64	2.45	2.56	2.24	2.64	1.75	2.60
401-540	4.25	3.03	2.67	2.75	2.45	2.65	NA	2.74	NA	2.68
541-680	4.50	3.03	2.67	2.75	2.45	2.65	NA	2.74	NA	2.68
681-920	4.80	3.03	2.67	2.75	2.45	2.65	NA	2.74	NA	2.68
921-1200	5.00	3.03	2.67	2.83	2.45	2.74	NA	2.83	NA	2.73
1201-1450	5.20	3.03	2.67	2.83	2.45	2.74	NA	2.83	NA	2.73
1451-1675	5.35	3.03	2.67	2.83	2.45	2.74	NA	2.83	NA	2.73
1676-over	5.50	3.03	2.67	3.22	2.45	3.09	NA	3.06	NA	3.11

It should also be noted that small businesses in Canada may be more affected by the "intra-provincial" toll rates in use across Canada. In developing the ratio for small business, no attempt was made to take this into account as there would be no way to use this in the economic model; regional impacts are determined by using the appropriate industrial mix, but regional price changes are not possible. However, it should be noted that a further level of sophistication could be added in this way. Data collected during the study makes it possible to examine the extent of regional differences in intra-provincial message toll rates. Exhibit 15, overleaf, provides a comparison of these rates across Canada.

For the determination of the appropriate ratio for Canada-U.S. rates, the recent restructuring of B.C. Tel's Canada-U.S. rates was taken into account through the use of an 80%-Bell/20%-B.C. Tel composite rate. Similarly, for the U.S. rate, a composite of 80%-AT&T/20%-MCI was used. Rates at 300, 1200 and 2000 miles were averaged to determine the appropriate ratio. On this basis, the ratio determined was 0.833.

For the determination of the appropriate ratio for Canada-Overseas rates, Telecom Canada rates through Teleglobe Canada for Canada-U.K. and Canada-Japan were compared with AT&T rates for U.S.-U.K. and U.S.-Japan. The ratio of the average rate for the U.S. service in U.S. dollars to the average rate for the Canadian service in Canadian dollars was 0.616.

Wide Area Telephone Service (WATS)

For the ratio of WATS service rates, we were fortunate to be able to model the annual usage of two large firms, one large resource industry firm, and one large retail-oriented firm. Since the structure of the WATS rates in Canada and the U.S. is similar in terms of their zones, the ratios were determined by costing the actual usage by these two firms. In both cases, WATS 10 services, not WATS 160 services, were used throughout Canada.

Exhibit 15: Comparison of Intra-Provincial Toll Rates

(Cost for a 5-Minute Daytime Call)

Carrier	Nfld Tel	MT&T	Isl. Tel	NB Tel	Bell	MTS	SaskTel	AGT	BC Tel
25 Miles	$1.37	$1.35	$1.43	$1.12	$1.61	$0.86	$1.30	$1.19	$1.65
50 Miles	$1.82	$2.45	$2.33	$1.56	$2.16	$1.16	$1.70	$1.59	$2.10
100 Miles	$2.42	$3.30	$2.48	$2.18	$2.66	$1.56	$2.35	$2.24	$2.70
150 Miles	$3.07	$3.65		$2.48	$3.01	$1.86	$2.90	$2.64	$2.75
200 Miles	$3.37	$4.05		$2.68	$3.11	$2.06	$3.05	$2.94	$3.05

For the resource-based company, the ratio of the cost in U.S. rates and dollars to the cost in Canadian rates and dollars was 0.37, and for the retail-oriented company the ratio was 0.42. On this basis, the ratio used for WATS services was 0.395.

"800" Service

For the "800" Service within Canada, the mix of zones and traffic volumes was based on the same distribution of calls as for WATS. That is, the WATS calling patterns of the same two firms were used. On this basis, the ratio of the cost for domestic 800 service in U.S. rates and dollars to the cost in Canadian rates and dollars was 0.483.

No detailed calling patterns were available to model the Canada-U.S. "800" Service. For this ratio, equal volumes of calls in each of the three zones from a base in area code 416 were used. The cross-border "800" Service ratio was 0.898.

Private Line Voice Services

The greatest difference between Canadian and U.S. rates occurred in respect of private line voice rates. For Canadian rates, a composite of 85% Bell or Telecom Canada and 15% CNCP Telecommunications was used. For U.S. rates, a composite of 85% AT&T and 15% MCI was used. Rates were averaged for 300, 1200 and 2000 mile circuits. The ratio of the cost in U.S. rates and dollars to the cost in Canadian rates and dollars was 0.366.

For Canada-U.S. private line services, the service is billed by each carrier independently, and the domestic tariffs are used to determine the rate for each portion. A review of sample billings for a number of users indicated that a 50/50 Canada-U.S. cost would be an appropriate average to use for Canada-U.S. private line voice services. The resulting ratio is 0.685.

Telpak Service

For the ratio for Telpak service, the rates for Telpak C in Canada (60 voice grade circuits) were compared with the rates for equivalent purchase of individual voice grade private lines in the U.S. Telpak is not provided in the U.S. The rates could have been compared to a U.S. broadband or T1 service such as AT&T's Accunet service, but the comparison becomes more complex because of the requirement for multiplexing and demultiplexing equipment in order to provide the voice grade equivalents.

Comparing the rates at 300, 1200 and 2000 mile distances yields a ratio of 0.754 for domestic Telpak service. For Canada-U.S. Telpak service, the ratio determined on the basis of 50% of the costs occurring in Canada was 0.880.

Private Line Data Services

The basis for the comparison of Canadian and U.S. private line data services was 9.6 kilobit/sec. and 56 kilobit/sec. synchronous digital data services over distances of 300, 1200 and 2000 miles. For the 9.6 kilobit service, the ratio of U.S. to Canadian rates was 0.49. For the 56 kilobit service, the ratio was 0.30. For the ratio of U.S. to Canadian private line data services, a numerical average of these two rates was used, resulting in an overall ratio for private line data services of 0.390.

For Canada-U.S. and Canada-Overseas services, it is assumed that half is billed at Canadian rates, therefore resulting in a ratio of 0.695.

Local Service Costs (Voice and Data)

For two reasons, the comparison of local rates between the U.S. and Canada was one of the more difficult aspects of the study from a methodological perspective. First, as indicated earlier, it was difficult for users to provide to us detailed information on the breakdown of costs between leased terminal equipment and central office access lines. Second, since local

rates in the U.S. are subject to state regulation, there is a very wide divergence in both rates and rate structures. In some areas, flat rate PBX trunks or even flat rate single line business services are not offered. Furthermore, terminal equipment or CPE (Customer Premises Equipment) is completely deregulated in the U.S., and local exchange carriers such as the former Bell operating companies are not permitted to lease terminal equipment to users.

In order to include in this study both a reasonable representation of the range of PBX trunk and single line business rates across the United States, U.S. cities were paired with Canadian cities and the ratio established on this basis was used in developing the ratio for each user. Flat rate PBX trunk rates were used in this comparison. The range of ratios established in this way ranged from a low of 0.47 to a high of 1.41.

For the small and medium business sector, single line business rates, as opposed to PBX rates, were used. A composite of Toronto, Regina, Winnipeg, Vancouver and Halifax was used with the appropriate pairings as established above. The composite ratio was 1.01.

Telex

In establishing rates for Telex, rates for Montreal-Toronto, Montreal-Winnipeg and Montreal-Vancouver were averaged and compared with the domestic U.S. rate, which is a flat rate within the continental U.S. On this basis, a ratio of 0.379 was established. For Canada-U.S. Telex rates, the ratio was an average of the Toronto-New York and Toronto-Los Angeles rates compared with the U.S. rate to Canada. On this basis, a U.S.-Canada to Canada-U.S. ratio of 0.832 was established. For the international ratio, rates to the U.K. and Japan were averaged. The resulting ratio was 0.690.

Packet Switched Data

For packet switched data, the Telecom Canada Datapac service was compared with an AT&T offering of a 9.6 kilobit/sec. accessed packet switched service. The U.S. rates are distance-insensitive. Accordingly, rates for 300, 1200 and 2000 miles were averaged, and levels of usage of 3000 kilopackets per month and 10,000 kilopackets per month were used, representing annual expenditures in the range of C$50,000-$150,000 per year in Canada. The numerical average of the ratios at these two levels of usage was 0.752.

Satellite Services

The rate according to the 1985 Telesat tariff for a full-period Type III pre-emptible service was compared with similar services provided by RCA Americom, Western Union, Hughes Communications, GTE-Spacenet and AT&T. On this basis, the average ratio established was 0.644. It is difficult, given the different types of satellite services and their terms and conditions, to obtain precisely comparable services. Even within the U.S., the rates for these services ranged from a low of US$720 thousand to a high of US$960 thousand. Telesat's 1985 rate in Canadian dollars was $1.33 million.

SIGNIFICANCE OF THE EXCHANGE RATE

The significance of the exchange rate was discussed earlier, but is repeated here in more detail in order that its significance is well understood, but not overemphasized.

There is no question that the exchange rate is significant when a buyer of telecommunications services is comparing two alternatives, one offered in Canadian dollars, the other in U.S. dollars. In that case, the exchange rate is a real consideration because the exchange rate affects the number of Canadian dollars the buyer would pay for the service offered in U.S. dollars. Accordingly, in our analysis and discussion of international competition, we have considered the impact of the exchange rate.

In the telecommunications cost portion of the study, the exchange rate issue is not as well defined. The objective in comparing U.S. and Canadian rates, and in developing the appropriate ratio, is merely to define a price change, or level of change in rates, which will be used in the economic model. Since the results of the model are linear with respect to the price change imposed, one can begin with one value for the exchange rate, and calculate the impact of other exchange rates. However, it is also recognized that the "base case" or initial run of the model, and the impacts estimated there, will receive the most attention from readers of the study. Accordingly, the choice of an exchange rate to use for the analysis has strategic as opposed to analytical significance.

Given that one of the objectives of the study was to establish the impact of changing telecommunications rates on the competitiveness of Canadian industry, and given that in the global marketplace exchange rates are real when selling prices are established, the use of a current value for the exchange rate in the base case analysis is reasonable. Readers might also be inclined to dismiss or discount results based on a hypothetical exchange rate "at par". For these reasons, a value of $1.4 Canadian dollars per U.S. dollar was used in establishing the final ratios for input to the economic model. The ratios developed on this basis are presented in Exhibit 16, overleaf.

DEVELOPMENT OF INDUSTRY RATIOS

Once the ratios by service were developed as shown in Exhibit 16, the ratios for each user were developed by applying these ratios to the level of expenditures by service provided by each user. Where an industry sector was represented by more than one firm, a weighted average of the ratios for the companies in the industry sector was used. The basis of the weighting was generally total annual revenues, where such data was available. In other cases, assets or expenditures were used. The ratios for the industries sampled are shown in Exhibit 17, overleaf.

Exhibit 16: U.S.-Canada Rate Ratios

(Exchange Rate 1.40)

LARGE BUSINESS

		RATIO US/CAN
MESSAGE TOLL	CANADA - CANADA	0.630
	CANADA - U.S.	1.166
	CANADA - OVERSEAS	0.862
WATS	INTRA-PROVINCIAL	0.553
	INTER-PROVINCIAL	0.553
"800" SERVICE	CANADA - CANADA	0.676
	CANADA - U.S.	1.257
PRIVATE LINES - VOICE		
	CANADA - CANADA	0.512
	CANADA - U.S.	0.959
	CANADA - OVERSEAS	0.959
TELPAK		
	CANADA - CANADA	1.056
	CANADA - U.S.	1.232
	CANADA - OVERSEAS	1.232
PRIVATE LINES - DATA		
	CANADA - CANADA	0.476
	CANADA - U.S.	0.938
	CANADA - OVERSEAS	0.938
PBX TRUNKS		0.650 - 1.970
TELEX OR TWX -	CANADA - CANADA	0.531
	CANADA - U.S.	1.165
	CANADA - OVERSEAS	0.966
PACKET SWITCHED -	CANADA - CANADA	1.053
	CANADA - U.S.	1.053
	CANADA - OVERSEAS	1.053
SATELLITE TRANSPONDERS		0.900
SPECIAL ASSEMBLIES & NON-TARIFFED SERVICES		1.000

SMALL BUSINESS

		RATIO US/CAN
MESSAGE TOLL	CANADA - CANADA	0.660
	CANADA - U.S.	1.166
	CANADA - OVERSEAS	0.862
WATS	INTRA-PROVINCIAL	0.553
	INTER-PROVINCIAL	0.553
PRIVATE LINES - VOICE		
	CANADA - CANADA	0.512
SINGLE LINE BUSINESS RATE (COMPOSITE)		1.410

Exhibit 17: U.S.-Canada Rate Ratios by Industry Sector

Industry Sector	Wtd. Ave Ratio
Radio and Tel. Broadcasting	0.928
Other Fin. Inst. & Real Estate	0.910
Wholesale Trade	0.746
Banks and Credit Unions	0.792
Retail Trade	0.927
Misc. Services to Bus. & Pers.	0.881
Truck Transport	0.870
Insurance	1.077
Air Transport	0.816
Accommodation & Food Services	1.094
Aircraft & Parts Mfgrs.	1.016
Misc. Manufacturing Ind.	0.770
Gas Distribution	0.716
Agricultural Implement Ind.	0.689
Motor Vehicle Mfgrs.	0.886
Iron and Steel Industry	0.804
Major Appliances Elect. & Non.	0.850
Cement Mfgrs.	0.914
Forestry	0.773
Petroleum and Gas Wells	0.921
Aluminum Smelting & Refining	0.968
Electric Power	1.124
Iron Mines	0.712
Fish Products Industry	0.805
Flour and Breakfast Cereals Ind.	0.752

For the remaining industry sectors in the Statistics Canada Input-Output Model, the following approach was used. For industry sectors which appeared to be similar in nature to sectors which were sampled (for example, different types of mining), the ratio for the similar industry sector was used. For industry sectors which are composed primarily of small and medium sized businesses, the small-medium business ratio was used. For industry sectors which did not fit into either of the above classes, a simple numerical average of the ratios for all industry sectors was used.

The use of these ratios in the impact analysis is described in the following chapter.

THE IMPACT ANALYSIS

An impact study is built around a "What if...?" analysis. In this case, the situation analyzed can be summarized as:

> "What if Canadian business telecommunications rates were changed to the level of those in the U.S.?"

The way this was done was by reducing the telecommunications expenditures by every business sector in the economy by the appropriate amount, based on the weighted average U.S./Canadian ratios developed earlier. Telecommunications prices were decreased by the full amount in 1986 and remained at this lower level through 1990, the last year of the analysis. This price change was applied only to business telecommunications expenditures, not to those of households.

While the telecommunications price changes by industry sector ranged from a decrease of 31 percent to an increase of 12 percent, the average change across the Canadian industry sectors sampled was a reduction in telecommunications costs of 13 percent. It should be emphasized once again that these results are based on a sample of firms which was heavily weighted by the presence of large users of telecommunications services. Such a sample was accepted by the sponsors of the study as appropriate for defining the price change to be imposed. However, the sample was not designed to be representative of firms or industry sectors.

It must also be emphasized that this reduction in telecommunications costs is considered to be provided unilaterally to the business sector, with no corresponding increase in telecommunications costs assumed to be borne by any other sector of the economy or any other class of users. The imposed price changes are equivalent to a telecommunications expenditure reduction which varied by year from a low of $675 million in 1986 to a high of $879 million in 1990. This approach is equivalent to legislative price control. Other policy options such as an explicit government subsidy or some form of rate adjustment could have been analyzed using the same approach, but these policy options were outside the terms of reference for the study.

In addition, no assumptions have been made about formal pricing regulations for telecommunications companies, subsidies, or other mechanisms by which such a pricing change would be implemented. This price change was not assumed to have any direct effect on the government. In other words, the reduction in business expenditures was considered to be costless. As stated earlier, no attempt was made to consider any implications for Canadian telecommunications carriers, their rates or their financial structures.

As well as the pricing assumption, this study assumes that if Canadian telecommunications companies were required to charge U.S.-equivalent rates, there would be no incentive for users to use facilities or services other than those provided by Canadian carriers. In other words, the impact of international competition is reduced to zero. This results in a reduction in the import of telecommunication services from the U.S.

HOW THE IMPACT ANALYSIS WAS CONDUCTED

The impact of changing telecommunications costs in the manner and under the assumptions described above was determined in the following manner. Using The Informetrica Model (TIM), a large, disaggregated model of the Canadian economy, a forecast identical to Informetrica's Post II-85 outlook and containing some 4,000 separate measures of economic activity, prices and incomes, was prepared for the period 1986-1990, with the reduction in business telecommunications costs in effect from 1986 onward as the only assumption change. These measures of economic activity were compared with the measures forecast by the Informetrica Reference forecast. The regional implications were examined in a similar manner using Informetrica's Regional-Industrial Model (RIM). Detailed descriptions of both models are provided in Appendix B. The only difference in the inputs to the two forecasts was the use of the industry-specific change in telecommunications expenditures, which thereby forms the basis for the comparison.

The impact of changing the telecommunications expenditures is therefore determined as the difference between the results of the two forecasts year-by-year as the change in telecommunications expenditures flows through the various sectors of the economy, affecting prices, wages, imports, exports, employment, disposable incomes, and so on. In other words, while the econometric model has certain forecasting assumptions built into it, we are considering the impact of one specific change - the reduction in telecommunications expenditures - and any other assumptions underlying the two forecasts being compared are only of secondary significance. The results of the impact analysis should be interpreted with the foregoing in mind.

NATIONAL RESULTS

The results of the analysis are summarized in Exhibits 18 and 19, overleaf. Exhibit 18 contains selected national indicators, whereas Exhibit 19 contains industry-specific results.

The general results of the impact can be summarized as a lowering of prices resulting in higher domestic real incomes, employment, and activity as well as improvements in Canada's external trade position. Not surprisingly, the principal impact of the reduction in telecommunications expenditures outlined above is a direct lowering of the general costs of operation of most Canadian businesses. The direct impact varies between industries in proportion to the role of telecommunications in their input costs and the mix of telecommunications services they use. The telecommunication cost reductions are passed on by each industry to the users of its output, that is, businesses, households, governments and foreigners. The cost reductions flow through into a direct reduction in the general cost of living as measured by the CPI. Further price reductions are induced as wages are bid down in response to lowered prices.

In activity terms, the price reductions result in increased domestic and foreign consumption of Canadian-made products. These gains are somewhat offset by increased goods imports due to higher Canadian real incomes, consumption and investment. It should be noted that the general improvement shown in the current

Exhibit 18: Selected National Indicators

	1986	1987	1988	1989	1990
			Impact		
			$C(000,000)		
Gross National Expend.(71$)	138.8	252.6	333.7	384.5	385.3
Personal Consumption	48.8	79.4	105.2	146.8	170.2
Government Current Exp.	5.2	9.5	10.1	9.1	5.3
Total Investment	18.9	67.3	122.3	146.7	142.5
Government	2.9	5.6	6.1	5.9	4.7
Business	16.0	61.8	116.2	140.8	137.7
Exports	18.2	32.2	47.3	61.3	67.9
Imports	-7.4	-6.0	0.1	12.0	7.5
Gross Domestic Product(71$)	112.8	212.4	284.7	330.8	330.9
Wages and Salaries $C	-139.1	-305.4	-481.8	-655.6	-807.8
Personal Disp. Income $C	-387.0	-682.6	-972.5	-1089.5	-1227.8
Real Pers. Disp. Income $K	101.9	122.9	145.5	207.7	226.5
Total Employment ('000)	4.6	9.9	15.0	19.4	22.1
Unemployment Rate %	0.0	-0.1	-0.1	-0.1	-0.1
Consumer Price Index(71=100)	-0.6	-0.9	-1.2	-1.4	-1.6
Prime Comm. Paper Rate %	-0.2	-0.2	-0.2	-0.1	-0.1

	1986	1987	1988	1989	1990
			% Impact		
Gross National Expend.(71$)	0.09	0.16	0.20	0.22	0.22
Personal Consumption	0.05	0.08	0.11	0.14	0.16
Government Current Exp.	0.02	0.04	0.04	0.03	0.02
Total Investment	0.06	0.20	0.34	0.38	0.36
Government	0.07	0.12	0.12	0.11	0.08
Business	0.06	0.21	0.38	0.43	0.40
Exports	0.04	0.07	0.09	0.12	0.13
Imports	-0.02	-0.01	0.00	0.02	0.02
Gross Domestic Product(71$)	0.08	0.15	0.19	0.22	0.21
Wages and Salaries $C	-0.05	-0.11	-0.16	-0.20	-0.23
Personal Disp. Income $C	-0.12	-0.20	-0.27	-0.28	-0.31
Real Pers. Disp. Income $K	0.10	0.11	0.13	0.18	0.19
Total Employment ('000)	0.04	0.08	0.12	0.15	0.17
Consumer Price Index(71=100)	-0.20	-0.28	-0.36	-0.42	-0.46

Exhibit 19: Gross Domestic Product at Factor Cost (Canada)

(71$ million)

	1986	1987	1988	1989	1990
			Impact		
All Industries	112.7	212.3	284.6	330.7	330.8
Primary and Construction	13.7	23.9	35.3	39.8	40.0
Manufacturing	40.6	84.1	111.1	125.0	117.8
Durables	22.6	51.6	68.0	76.1	69.0
Nondurables	18.0	32.4	43.1	48.9	48.8
Transportation & Storage	10.0	18.0	24.2	28.8	29.5
Communication	6.5	9.9	12.5	14.9	16.0
Utilities	2.3	4.8	6.6	7.9	8.0
Trade	12.9	23.7	32.3	39.8	40.4
Finance	6.5	11.0	13.5	15.2	15.4
Services	16.6	30.1	41.2	51.4	56.9
Public Administration	3.8	6.7	7.8	7.9	6.7
	1986	1987	1988	1989	1990
			% Impact		
All Industries	0.08	0.15	0.19	0.22	0.21
Primary and Construction	0.09	0.15	0.21	0.22	0.22
Manufacturing	0.14	0.27	0.34	0.36	0.34
Durables	0.15	0.31	0.38	0.40	0.37
Nondurables	0.13	0.22	0.28	0.31	0.30
Transportation & Storage	0.11	0.19	0.24	0.28	0.28
Communication	0.11	0.17	0.20	0.23	0.24
Utilities	0.05	0.10	0.13	0.15	0.15
Trade	0.07	0.13	0.17	0.20	0.20
Finance	0.04	0.06	0.07	0.08	0.08
Services	0.06	0.11	0.15	0.18	0.19
Public Administration	0.04	0.08	0.09	0.09	0.07

account balance induces further reductions in interest payments as Canadians are able to repay foreign debt and reduce further borrowings.

One implication of the improved current account situation and of the reduced inflation might have been an appreciation of the Canadian dollar. However, in this impact, it was assumed that the monetary authorities acted in such a way as to lower domestic interest rates sufficiently to maintain a stable exchange rate and a constant real interest rate spread between Canada and the U.S.

At the national level, the price impact induces a gain in Gross National Expenditure (GNE 71$), real final demand, equivalent to 0.1 per cent of the reference case level in the initial year of the impact. By 1990, the impact level of GNE is 0.22 per cent above the base case value. In proportionate terms, consumption and business investment, the most price sensitive categories of final demand, record the largest gains. The gain in exports might be considered to be understated in that no assumption was made that Canada would increase its share of the U.S. auto market in response to its lower costs.

As would be expected in any analysis which focused on price change, nominal wage incomes are down by less than half of the forecasted decline in consumer prices, the difference being made up by the gains in real activity and income.

The industrial gains are concentrated in the service and manufacturing sectors. In the initial years of the impact, the gains in manufacturing are almost evenly split between the durables and nondurables sectors. However, later, as the impact of the price declines is felt on machinery and equipment investment and on exports, durables manufacturing begins to record a disproportionate share of the gains.

In employment terms, the proportionate gains increase from 0.04 per cent of the base case level in the initial year of the price change to 0.17 per cent by 1990. This represents an increase of 20,000 person-years of employment above the reference case levels. As would be expected, manufacturing records the strongest proportionate gains. Only agriculture records a

decline in employment, but a corresponding increase in productivity, as marginal workers return to the urban centers in response to the declining unemployment rate. By the last year of the analysis, the unemployment rate is expected to decline by only 0.14 percentage points. The impact of the price changes on unemployment is slightly offset by the induced gains in labour force due to increases in real income.

REGIONAL RESULTS

The results of the regional impact analysis are summarized in Exhibits 20 and 21, overleaf. Exhibit 20 contains projections on the change in the Gross Provincial Product, and Exhibit 21 provides the estimated impact on employment. The impact on the Gross Provincial Product by province is illustrated in Exhibit 22, overleaf.

In general, the benefits of lower telecommunications costs would appear to be relatively broadly distributed across the country. In part, this is because of the importance of such cost reductions to the service sector in each province. More importantly, however, the decline in the aggregate price level induced by the fall in telecommunications prices and the corresponding gains in real incomes provides broadly-distributed gains to all provinces.

As would be expected, in both absolute and relative terms, of all the provinces, Ontario is expected to post the strongest gains in both employment and real Gross Domestic Product. This follows from the relative concentration in Ontario of highly price-sensitive durables industries which have both an export and investment orientation. The cumulative increase in real provincial GDP for Ontario over the 5 years of the impact study is equal to about 1.1 per cent of the level of real GDP in 1985.

Quebec, and to a lesser extent, Manitoba and New Brunswick, are expected to post gains in provincial activity induced by the increased real income. Consumer-related sectors such as manufactured food, knitting and clothing, furniture and appliances are all expected to post gains. Although the absolute impact on the trade sector in Manitoba is less than that in

Exhibit 20: Gross Domestic Product (71$)

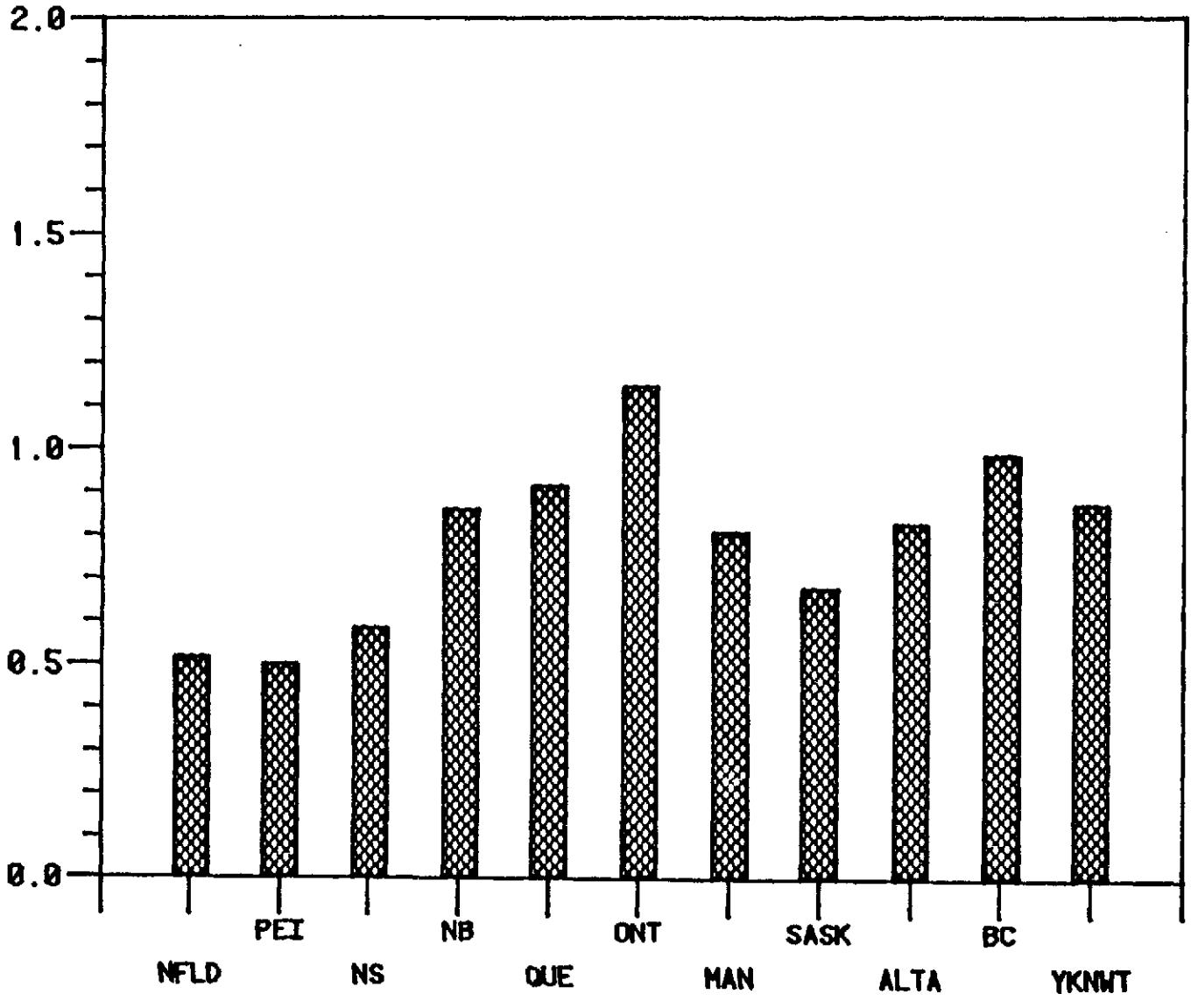
	1986	1987	1988	1989	1990
			Impact		
			(71$ million)		
Canada	112.7	212.3	284.6	330.7	330.8
Newfoundland	1.0	1.8	2.1	2.2	2.2
Prince Edward Island	0.2	0.4	0.5	0.5	0.5
Nova Scotia	1.9	3.3	4.2	4.8	4.8
New Brunswick	2.1	3.8	5.1	5.9	5.8
Quebec	23.0	45.0	60.0	70.1	71.1
Ontario	50.0	100.7	137.2	160.1	157.9
Manitoba	4.4	7.5	9.9	11.3	11.3
Saskatchewan	4.3	6.0	7.5	8.1	7.9
Alberta	11.4	18.9	25.2	29.6	30.2
British Columbia	14.1	24.0	31.6	36.7	37.5
Territories	0.4	0.8	1.2	1.4	1.5
	1986	1987	1988	1989	1990
			% Impact		
Canada	0.08	0.15	0.19	0.22	0.21
Newfoundland	0.05	0.09	0.10	0.11	0.10
Prince Edward Island	0.06	0.09	0.11	0.12	0.11
Nova Scotia	0.06	0.10	0.12	0.14	0.14
New Brunswick	0.08	0.14	0.18	0.20	0.19
Quebec	0.08	0.14	0.18	0.20	0.20
Ontario	0.09	0.18	0.23	0.26	0.25
Manitoba	0.08	0.13	0.16	0.17	0.17
Saskatchewan	0.08	0.10	0.13	0.13	0.13
Alberta	0.08	0.12	0.16	0.18	0.18
British Columbia	0.09	0.15	0.19	0.22	0.22
Territories	0.06	0.12	0.16	0.18	0.19

Exhibit 21: Employment

	1986	1987	1988	1989	1990
			Impact		
			(Thousands)		
Canada	4.6	9.9	15.0	19.4	22.1
Newfoundland	0.0	0.1	0.1	0.1	0.2
Prince Edward Island	0.0	0.0	0.0	0.0	0.1
Nova Scotia	0.1	0.2	0.3	0.3	0.4
New Brunswick	0.1	0.2	0.3	0.4	0.4
Quebec	1.0	2.4	3.5	4.6	5.2
Ontario	1.9	4.5	7.1	9.3	10.5
Manitoba	0.2	0.4	0.5	0.6	0.7
Saskatchewan	0.1	0.2	0.3	0.3	0.3
Alberta	0.4	0.7	1.1	1.5	1.7
British Columbia	0.7	1.2	1.8	2.3	2.6
	1986	1987	1988	1989	1990
			% Impact		
Canada	0.04	0.08	0.12	0.15	0.17
Newfoundland	0.03	0.05	0.06	0.07	0.08
Prince Edward Island	0.03	0.06	0.08	0.09	0.10
Nova Scotia	0.03	0.06	0.08	0.10	0.12
New Brunswick	0.04	0.08	0.12	0.14	0.15
Quebec	0.04	0.08	0.12	0.15	0.17
Ontario	0.04	0.10	0.15	0.19	0.21
Manitoba	0.04	0.07	0.10	0.12	0.13
Saskatchewan	0.03	0.04	0.05	0.06	0.06
Alberta	0.04	0.06	0.09	0.12	0.13
British Columbia	0.06	0.10	0.13	0.17	0.19

EXHIBIT 22

TELECOMMUNICATIONS IMPACT
CUMULATIVE EFFECT ON PROVINCIAL RDP RELATIVE TO 1985



Alberta, Manitoba's role as a distribution centre is still sufficiently important in the provincial economy that trade accounts for over 20 per cent of its cumulative gains in real GDP. As would be expected, due to the relative dominance in their economies of public and other service sectors which are somewhat insensitive to this impact, Newfoundland and the other Atlantic provinces record only modest gains.

However, the gains in goods production in other provinces should not be ignored. Even resource sectors such as pulp and paper are expected to gain in international competitiveness because of the general price reduction and associated decline in unit labour costs relative to the reference outlook. In Alberta, while neither energy exports nor domestic oil production are expected to increase as a result of the price change, the increased level of domestic demand does generate a requirement for additional natural gas production.

SENSITIVITY TO ASSUMPTIONS

In general, the national and regional models used will behave linearly with scalar changes in their inputs. In this particular impact study, the major channel is through prices to real activity. If the price drop was scaled by 50 per cent, then similarly scaled results would be expected for nominal and real results shown in the summary tables. In other words, the ultimate decline in a concept such as consumer prices will be proportionate to the difference in the input telecommunications price change assumption. Similarly, the gain in real activity will be increased in proportion to the change in the price assumption if the scale change is applied uniformly to all industries and all other assumptions are proportionately adjusted as well.

Alternative Simulations

In general, the current structure of telecommunication costs in Canada has been in place for a sufficient period that such costs can be considered to be fully reflected in the general cost structure of the economy. The reference outlook used for the

impact study can be used as an example of a forecast in which this cost structure is assumed to remain unchanged. The U.S. assumptions which went into that outlook, developed from a Wharton EFA forecast, reflect a view that telecommunications costs will roughly escalate in line with the general inflation pattern. In the Informetrica reference, this assumption is maintained for Canadian costs as well. In other words, the basic telecommunication cost relationships are assumed to be unchanged throughout the forecast period.

The impact study presented above portrays the impact of a unilateral reduction in Canadian telecommunications costs with no corresponding adjustments to U.S. costs. The models used are sufficiently linear that a change from a price reduction to an increase of the same relative magnitude would provide almost identical macroeconomic results except the direction of the impact would be reversed, i.e., that activity would decrease rather than increase. If no adjustments were made to the industry mix, scale adjustments to the price change would result in a similarly scaled change in the results. At the aggregate level, the only additional differences would be due to the weighting differences associated with the industrial composition of the price change and of the economy in general.

DISCUSSION OF RESULTS

This analysis indicates that benefits would accrue to most sectors of the economy and all regions of the country if business telecommunications rates in Canada were to be structured at levels currently existing in the United States.

It is also important to examine how the reduction in telecommunications costs flows through the various sectors of the economy. In our view, the reduction in telecommunications expenditures used in this study has a more favourable impact on the economy than, say, reducing personal income taxes by the same amount. The reason for this is that decreasing input costs to business, particularly an input cost which affects all industrial sectors, is reflected in lower output prices and higher industrial activity. It was assumed that competitive pressures would require that the full amount of the telecommunications

expenditure reduction be reflected in lower final output prices. Reducing personal income taxes increases personal disposable income directly, and therefore has a greater impact on the demand for imports than does making an equivalent reduction in the price of a domestically produced and consumed good or service such as telecommunications services.

In interpreting these results, however, the effect of the assumptions must also be considered. It should be emphasized that for the purposes of this analysis, the telecommunications expenditures for Canadian industry in total were reduced by amounts ranging from $675 million in 1986 to $879 million in 1990. However, the costs to the carriers of providing the telecommunications services have not changed significantly. It would therefore likely be necessary to find other sources of revenue, or other offsetting changes in rates, to satisfy the revenue requirements of the carriers in spite of the increased usage of telecommunications services. No offsetting increases in telecommunications costs were assumed to be borne by any other sector of the economy.

It was also explained earlier that changes in the mix of services, particularly for interexchange services, would likely result if relative changes in rates for telecommunications services were imposed. However, such effects were beyond the scope of the study. In all probability, the result of such a change in consumption patterns would be to enhance the benefits to industrial users, and hence to the economy as a whole, because telecommunications managers would act to further reduce costs. Again, however, the impact on the telecommunications carrier industry would likely be negative.

OVERALL FINDINGS OF THE STUDY

In this closing chapter of the report, we discuss the detailed findings of the study in their broad policy context.

OVERALL FINDINGS

The findings with respect to international competition and the impact of adopting U.S. telecommunications rates are described below.

International Competition

Much of the investigation in this part of the study involved discussions with major users and carriers about what is technically possible, legally permissible and economically viable in respect of "bypass", or what we have more generally called "international competition". Across the range of voice, data, message and image services, major users on occasion develop alternative methods of communication which minimize costs through the use of non-conventional routings.

With respect to the current extent of international competition, we estimate the impact on carrier revenues is of the order of $4.6 million annually, of which $1.5 million is the loss of settled Canada-U.S. toll revenues due to cross-border resale, and $3.1 million is the loss of Canada-Canada, Canada-U.S. and Canada-Overseas Telex revenues through discount message service providers and U.S.-based international Telex carriers. No estimates of the loss in revenue due to off-ending from private lines or private network nodes terminating in the United States were available.

The main protection for Canadian telecommunications carriers is the cost of access to alternative service-providers in the U.S. Both the current Canada-U.S. exchange rate and the tariff restrictions on sharing and resale serve to keep the cost of access to cross-border resellers and other service providers in the U.S. high. However, there is concern among the carriers that changes in the sharing and resale restrictions could affect the

cost of access to a significant extent, and make private line access available to a much greater number of smaller telecommunications users.

Telecommunications Costs

The adoption of U.S. business telecommunications rates in Canada, resulting in total telecommunications expenditure reductions for Canadian industry of the order of $675 to $879 million over the 1986-1990 period, would benefit most industrial sectors, and the economy generally. However, in keeping with the relatively low cost of telecommunications relative to other input costs for most businesses, the impact is not large.

Regional impacts of lowering telecommunications costs show the greatest benefit in the manufacturing-oriented provinces, such as Ontario and Quebec. All regions of the country would benefit to some extent, although again the impacts are not large.

Two additional questions were posed by the Terms of Reference. They referred to the impact of changing telecommunications rates on the competitiveness of Canadian industry, and the attractiveness of Canada as a location for business activity.

The first of these questions is answered by the impact analysis. The general impact on the economy of lower telecommunications costs relative to other costs, domestic and foreign, is clearly positive. In particular, as these lower costs feed through the domestic price structure, further price reductions are induced. The impact of the resulting improvement in costs relative to those of our trading partners is seen in the improved real trade balances, with higher exports and lower imports. The impact will be substantially different by industrial sector depending on their sensitivity to price changes for their costs and for their own outputs.

With respect to the attractiveness of Canada as a location for business activity, we addressed specific questions on this matter to large business users as well as carriers. With few exceptions, the responses indicated that while the cost of

telecommunications services is sometimes significant, it is rarely a primary consideration even for the location of company facilities within Canada. In some cases, businesses with large retail operations will try to take advantage of free calling areas, but this normally means picking an advantageous location within a major metropolitan area. The single exception to the above was one firm operating in both Canada and the U.S. which found cross-border "800 Service" more expensive than establishing an independent retail presence in the U.S. In this particular case, approximately 30 jobs were created in the U.S., jobs which could, from an operational point of view, have been located in Canada.

DISCUSSION OF OVERALL FINDINGS

While the current extent of international competition does not appear to be significant, the study served to highlight the difficulties which face regulators and policy-makers in the telecommunications field. The most significant factor limiting the extent of international competition appears to be the cost of access. Should any change take place in this cost, through, for example, changes in the exchange rate or in the restrictions on sharing and resale, then users would be expected to react quickly.

The ability of users to react quickly to price and tariff changes, or indeed to any change in the regulatory environment, has broad implications for policy-makers as well. During our investigation, it was quite apparent that most major users of telecommunications services have at their disposal both the technologies and the management tools to control their telecommunications costs to an exacting degree. Many major users employ highly sophisticated telecommunications planners, and they react quickly to any change in rates, tariffs or regulations. The mix of services they utilize at any point in time is a function of the rates in effect, and they monitor their costs very closely. Accordingly, while we assumed that only the rates would change if U.S. rates were imposed in Canada, it is readily apparent that the mix of services would also change, particularly for interexchange services. This would tend to enhance the positive impact of such a change in rates for Canadian industry.

The impact of such a change in rates on the telecommunications carrier industry was not within the scope of the study. However, it is apparent that the unit costs of providing telecommunications services would not change significantly in spite of increased traffic volumes due to the increased industrial activity. A lowering of their overall revenues with no corresponding reduction in costs would leave their revenue requirements unsatisfied. Additional sources of revenues would have to be tapped, or rates for other classes of subscribers would have to be adjusted.

Finally, the elimination of rate differentials between the U.S. and Canada will not serve to eliminate all use of non-Canadian facilities. Off-ending into the local networks from Canada-U.S. tie-lines or private networks and the use of private lines to access U.S. WATS lines will continue because the economic incentives to do so are created by differences between domestic and cross-border rates, not merely by rate differentials between similar domestic services.

APPENDIX A

THE ECONOMICS OF THE U.S. RESELLER INDUSTRY

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THE ECONOMICS OF THE U.S. RESELLER INDUSTRY

This appendix describes the development and current status of the telecommunications reseller industry in the United States. Inasmuch as U.S.-based resellers are a source of international competition, the economics of the domestic reseller industry in the U.S. can have a bearing on their potential impact in Canada.

The U.S. Resale Environment

During the past few years, the U.S. long-distance toll market has experienced a tremendous influx of competitive firms, by most estimates approximately 300, each seeking a share of AT&T's once-protected monopoly business. The vast majority of these firms do not own intercity transmission facilities, but instead compete by reselling existing transmission capacity owned and operated by AT&T Communications, the former Bell Operating Companies, and the relatively small number of other "facilities-based" carriers, among them MCI, GTE Sprint, Satellite Business Systems, and ITT.

Resellers operate by purchasing intercity transmission services in large quantities at bulk rates and then repackaging and marketing these services to end-use customers at retail rates. Although a distinction is often made in the toll industry between "resellers" and "facilities-based carriers," the more valid and meaningful distinction is between the wholesale and retail functions within the toll market.

The wholesale transmission function involves the actual operation of microwave, fiber optic, satellite, and other transmission media that carry toll traffic between cities; the retail function involves switching (routing calls to their destination), marketing, billing and collection, and customer service. So-called facilities-based carriers are actually vertically integrated firms that perform both wholesale and retail functions; pure resellers operate strictly in the retail end of the market.

Resale has played a major role in the development of intercity competition in the United States. It has opened the market to numerous small competitors lacking the necessary capital to construct transmission facilities, and has permitted the integrated carriers to compete meaningfully with AT&T's widespread service coverage without first having to duplicate its nationwide network.

Reseller Operating Margins

As with other retail businesses, the financial viability of long-distance resale is largely dependent on the margin between revenues and wholesale costs. This operating margin is affected by a multiplicity of factors, and varies widely among resellers. On the cost side, a reseller's operating margin is affected by the availability of alternative wholesale transmission services and the rates for those services, the reseller's overall traffic volumes, and the mileage and time-of-day distribution of its traffic. On the revenue side, the margin reflects the reseller's retail rates (which are usually heavily influenced by AT&T's message toll rates), total traffic volumes, and the mileage and time-of-day mix of traffic.

Depending on size, location, applicable regulatory restrictions, and other factors, resellers may purchase transmission services entirely from one carrier (e.g., AT&T) under one tariff (e.g., WATS), or they may purchase a mixture of different transmission services from a variety of vendors. In general, the larger the reseller, the greater its wholesale options.

The reseller's wholesale costs would include the charges for incoming access to its switch, plus the charges for its private line and WATS services used to complete the calls. Wholesale costs are highly variable, depending on the reseller's particular operating characteristics, geographic location, and service territory. A "typical" reseller using AT&T interstate WATS would incur wholesale costs ranging from approximately $.20 to $.28 per minute, assuming it generates at least 120 hours of use per line.

The retail rates charged by resellers vary at least as much as their wholesale costs. Exhibit 1, overleaf, compares the rates in $US for 19 long-distance carriers, including AT&T, some of the national facilities-based carriers (MCI, GTE Sprint, etc.), and several resellers of various sizes. Allnet, a large national reseller, offers originating service in many cities throughout the U.S.; many of the smaller resellers listed have much more localized operations. For instance, Florida Long Distance and Teltec Savings Communications offer originating service only from a few Florida cities, American Network operates from selected cities in the Pacific Northwest region, and RCI offers originating service from only several cities in New York and surrounding states.

Exhibit 2, overleaf, depicts illustrative operating margins (difference between rates charged and wholesale costs) in $US for five of the 19 carriers listed in Exhibit 1. We have analyzed the possible operating margins for the high density route New York to Los Angeles (equivalent in the Canadian environment to the Toronto to Vancouver route discussed under cross-border resale). Operating margins in the range of 25-60% can be obtained. These margins vary for other city pairs and for other mixes of traffic. For example, the margins are typically somewhat lower when a lower percentage of daytime traffic is assumed.

These comparisons of wholesale costs and retail rates indicate that typically a large proportion of a reseller's revenues (typically in the range from about 40% to 80%) are used to pay the wholesale costs of access and interexchange transmission service. The remaining revenues, which reflect the reseller's gross margin, are available to cover other expenses internal to the reseller's operations, including engineering, uncollectibles, billing and collection, depreciation, advertising and marketing, customer service, and administrative and general expenses. Any residual remaining after recovering both the wholesale costs and the internal operating expenses represents the reseller's return on investment, or net profit.

Exhibit 1: Message Toll Rate Comparisons

(5 Minute Daytime Call - All Rates in US$)

Mileage Band	AT&T	Allnet	American Network	Am. Tel. Exchange	Commun. Co. of America	Eastern	Entel	Florida Long Distance	GTE Sprint	MCI
1-10	1.08	0.85	0.35	0.30	0.96	0.96	0.82	0.90	1.05	0.91
11-22	1.39	1.14	0.70	0.60	1.27	1.28	1.09	1.22	1.35	1.17
23-55	1.60	1.40	1.05	1.00	1.43	1.60	1.36	1.49	1.57	1.43
56-124	1.83	1.62	1.30	1.35	1.66	2.05	1.74	1.94	1.74	1.66
125-292	1.91	1.70	1.50	1.50	1.74	2.14	1.82	2.02	1.81	1.75
293-430	2.00	1.81	1.60	1.65	1.79	2.27	1.93	2.11	1.89	1.90
431-925	2.07	1.88	1.60	1.95	1.86	2.34	1.99	2.18	1.93	1.97
926-1910	2.12	1.93	1.60	1.95	1.90	2.40	2.04	2.24	1.98	2.03
1911-3000	2.33	2.09	1.60	1.95	2.11	2.70	2.29	2.53	2.17	2.20
3001-4250	2.47	2.36	1.60	1.95	2.24	2.80	2.29	2.53	2.34	2.39
4251-5750	2.58	2.46	1.60	1.95	2.31	2.91	2.29	2.53	2.45	2.48

Mileage Band	Ntwork I	North American Telephone	RCI	Starcom	Teltec	Thrifty Telephone Exchange	U.S. Tel	Westel Exchange	Western Union
1-10	0.51	0.47	0.75	1.75	0.71	0.25	0.90	0.60	1.12
11-22	0.83	0.78	0.99	1.75	0.95	0.55	1.16	0.60	1.12
23-55	1.25	1.27	1.29	1.75	1.28	0.95	1.42	0.75	1.32
56-124	1.69	1.78	1.66	1.75	1.62	1.30	1.65	1.10	1.65
125-292	1.75	1.84	1.74	1.75	1.72	1.45	1.74	1.15	1.75
293-430	2.04	1.91	1.89	1.75	1.83	1.60	1.89	1.25	1.86
431-925	2.16	1.98	1.96	1.75	1.90	1.70	1.96	1.25	1.92
926-1910	2.16	1.98	2.02	1.75	1.96	1.70	2.02	1.25	1.95
1911-3000	2.16	1.98	2.30	1.75	2.21	1.70	2.19	1.25	2.22
3001-4250	2.16	1.98	2.30	1.75	2.35	1.70	2.38	1.25	2.22
4251-5750	2.16	1.98	2.30	1.75	2.44	1.70	2.47	1.25	2.22

Exhibit 2: Retail Operating Margins (U.S. Dollars)

Los Angeles - New York

(Resale traffic mix assumed: 70% Daytime, 20% Evening, 10% Night/Wknd)

AT&T WATS

Company	Rate	Cost	Operating Margin
Allnet	$0.36	$0.24-$0.27	25.0%-33.3%
American Tel. Exchange	$0.35	$0.24-$0.27	22.9%-31.4%
Entel	$0.42	$0.24-$0.27	35.7%-42.9%
MCI	$0.39	$0.24-$0.27	30.8%-38.5%
RCI	$0.41	$0.24-$0.27	34.1%-41.5%

AT&T Private Lines

Company	Rate	Cost	Operating Margin
Allnet	$0.36	$0.24-$0.40	(11.1)%-33.3%
American Tel. Exchange	$0.35	$0.24-$0.40	(14.3)%-31.4%
Entel	$0.42	$0.24-$0.40	4.8%-42.9%
MCI	$0.39	$0.24-$0.40	(2.6)%-38.5%
RCI	$0.41	$0.24-$0.40	2.4%-41.5%

GTE Satellite

Company	Rate	Cost	Operating Margin
Allnet	$0.36	$0.17-$0.26	27.8%-52.8%
American Tel. Exchange	$0.35	$0.17-$0.26	25.7%-51.4%
Entel	$0.42	$0.17-$0.26	38.1%-59.5%
MCI	$0.39	$0.17-$0.26	33.3%-56.4%
RCI	$0.41	$0.17-$0.26	36.6%-58.5%

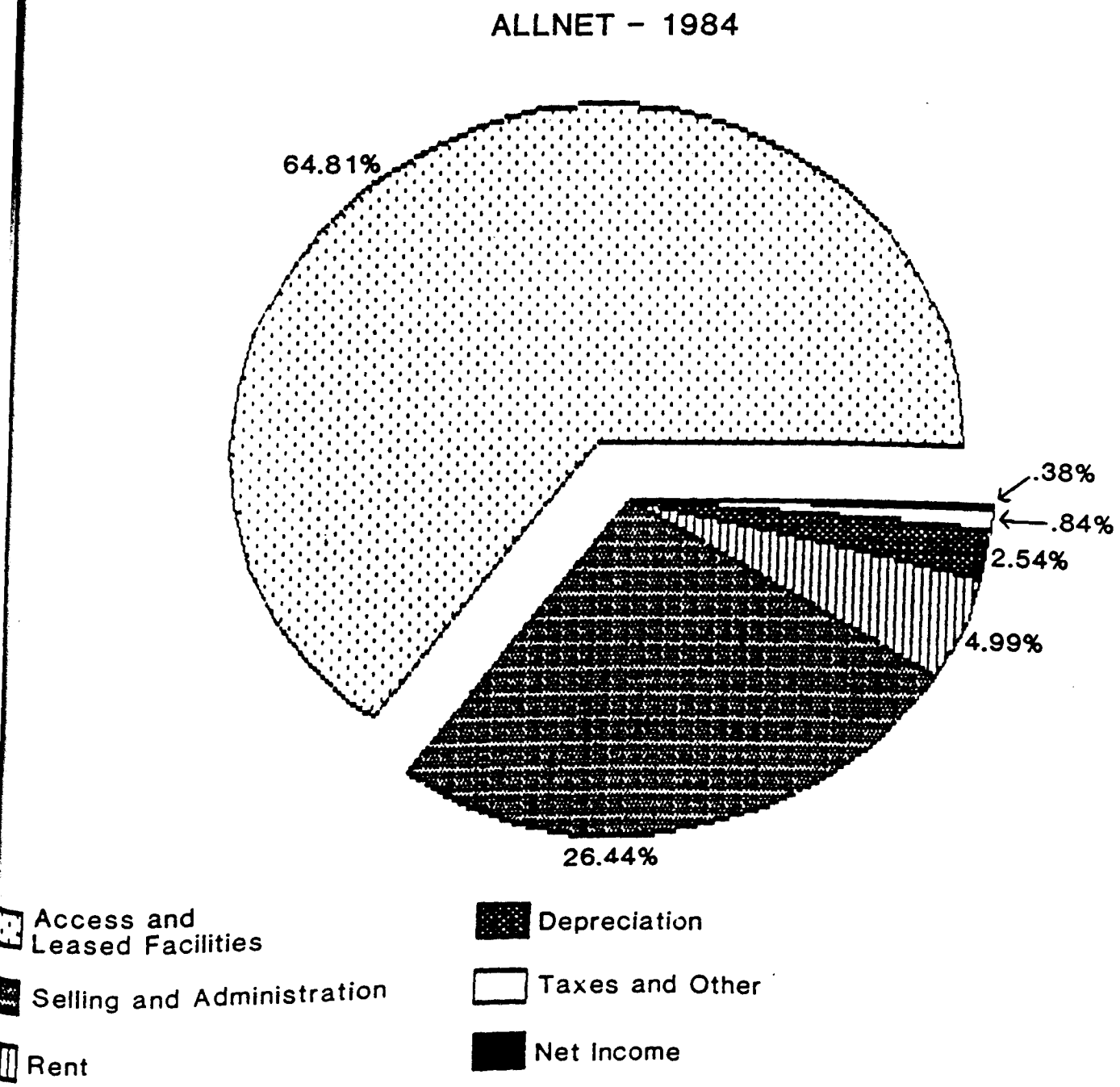
Exhibit 3, opposite, graphically depicts the breakdown of operating revenues for Allnet. Allnet's total "cost of sales"--which appears to include wholesale costs associated with access, WATS, private line, and other leased transmission facilities--accounted for roughly 65% of its revenues in 1984, leaving a gross operating margin of about 35%. Most of this margin--approximately 26% of total revenues--was devoted to expenses of sales and administration; approximately 2.5% represented depreciation expense (primarily related to its switches); 6% covered rent, interest, and taxes; and the residual--just .4% of total revenues--reflected net income available for a return on its stockholders' investment. The relatively large percentage of revenues devoted to the first category (which would include marketing, advertising, billing, customer service and other administrative expenses) is not surprising, since the value added by resellers like Allnet is primarily through these retail functions.

Allnet's revenue breakdown highlights the sensitivity of a reseller's profit margin to even slight variations in revenues, wholesale costs, or internal operating expenses. For instance, holding everything else constant, an increase of less than 1% in Allnet's wholesale costs would have eliminated its net operating income. Since the bulk of these wholesale expenses are access related, minor changes in the application or level of federal or state access charges would have a major impact on the firm's financial viability. But costs within the realm of the reseller's control also help determine financial success or failure. For instance, had Allnet's selling and administrative expenses been just 1.4% higher, its net profit in 1984 would have fallen to zero. Similarly, a slightly lower rate of uncollectibles, resulting in higher net revenues, would have strongly boosted the firm's overall earnings level.

The Future Prospects for Resale in the U.S. Toll Market

Assuming U.S. regulatory policies are not biased in one direction or the other, as the shake-out in the U.S. long-distance market occurs, the most efficient, well-managed firms will tend to survive and flourish. There is no reason to assume that resellers will be any more or less successful than

Exhibit 3: Breakdown of Operating Revenues



facilities-based carriers merely as a result of the different scope of their operations. Facilities-based carriers have greater control over their line-haul costs; however, these costs are not of overwhelming importance, and resellers, more narrowly focused, may be more successful in other crucial areas, such as marketing.

Of course, there is no assurance that U.S. regulatory policies will be unbiased, even if regulators attempt to achieve this result. Future regulatory policy decisions at the federal and state levels will play a major role in determining which long-distance firms survive, and which do not. For instance, in the interstate and most state jurisdictions, the competing facilities-based carriers pay 35% to 55% lower access charges than AT&T, in recognition of the inferior and less valuable access connections that they receive. However, as equal access is made available, this discount will evaporate; while the competing firms will benefit from better access arrangements and resultingly higher market shares, some carriers may be unable to absorb the additional access costs (which may be more than double for some carriers) and remain profitable.

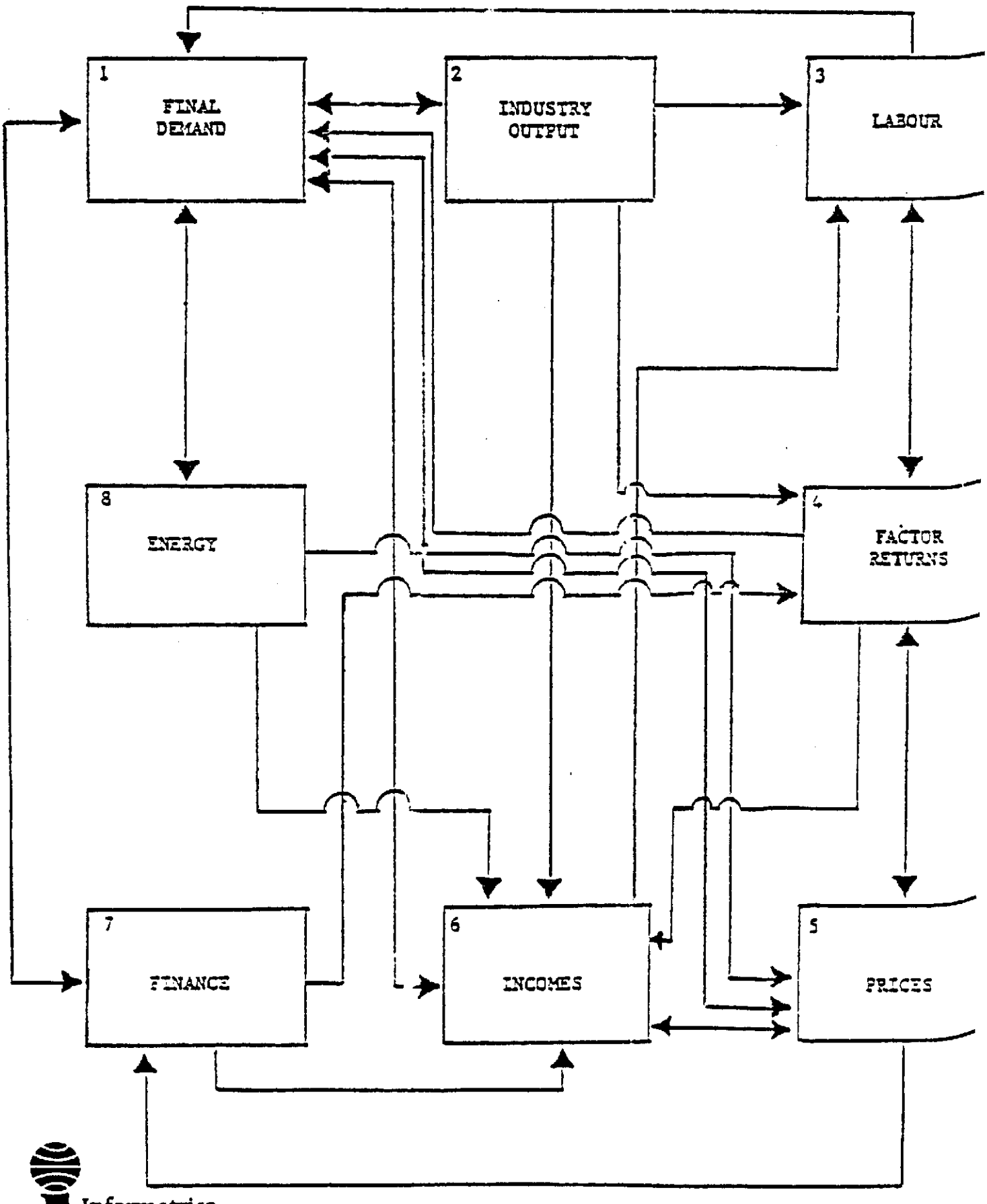
In sum, regulatory policy decisions during the next few years will play a critical role in determining the ability of resellers and competitive facilities-based carriers to survive the impending shake-out in the U.S. telephone industry. Unless regulatory policies are skewed against firms who compete strictly in the retail end of the business, there is no <u>a priori</u> reason why strong, efficiently managed resellers cannot thrive in a competitive environment. The mere ownership of transmission facilities is no guarantee of long-term success.

APPENDIX B

DESCRIPTION OF THE INFORMETRICA ECONOMETRIC MODELS

THE INFORMETRICA MODEL (TIM)
REGIONAL-INDUSTRIAL MODEL (RIM)

THE INFORMETRICA MODEL - SECTORAL STRUCTURE



Informetrica
Limited

THE INFORMETRICA MODEL (TIM)

The Informetrica Model (TIM) is a large, disaggregated econometric model of the Canadian economy. The basic structure of the model follows in the tradition of several predecessor models including those of the CANDIDE family, the Wharton EFA models and earlier models such as the Klein-Goldberger and Brookings models. The basic structure of TIM is shown in the flow chart below.

A highly simultaneous model, TIM provides forecasts for almost 4000 separate measures of economic activity, prices and incomes. One key attribute of TIM is its highly disaggregated final demand section. Separate estimates are available for:

- 50 categories of consumer expenditure,
- government expenditures by functional type and level,
- 50 export categories with separate equations for the U.S. and rest-of-world,
- 43 import categories with the same directional detail, and
- separate estimates for each of plant and equipment investment and capital stocks for over 40 industrial categories, and projections for residential construction.

The final demand sector is an important channel for the resolution of the impacts considered in this study. In general, most final demand categories are explained as functions of relative prices and incomes. Thus, any impact that affects either prices or incomes will directly change the level and/or composition of final demand. One characteristic of TIM is an endogenous government expenditure section with 'reaction functions' providing a linkage from the scale and composition of the economy or government revenues and/or activities, back to government expenditure on goods and services. In some impacts, these reaction functions have been specifically exogenized to exclude an additional government response.

Using an integral input-output sub-model, this substantial final demand detail is converted into the equivalent industrial output--Gross Domestic Product at factor cost--for approximately 79 industries. Thus, the level and composition of industrial activity is a direct function of that of final demand. The detailed final demand projections provide a rich content for the industrial projections.

The estimates of output and the corresponding capital stocks are the key explanatory variables in the production functions which provide consistent estimates of labour demand by industry. Thus, an impact which initially affected investment would also be expected to impact labour demand. Labour supply, the participation of people in the labour force, is primarily determined by job opportunities, income and underlying demographic trends.

The level of factor demands as defined by capital stock, employment and output as well as prices and interest rates is key to the derivation of nominal industrial income (GDP) disaggregated by industry in terms of wages, unincorporated income and surplus or return to capital.

An input-output based prices model is used to estimate detailed final demand prices using both the detailed industry GDP measures, foreign prices, taxes and subsidies ensuring that the value of final demand is consistent with the incomes derived from its domestic production. Thus, any impact on domestic incomes, unit labour costs or foreign prices is passed to domestic prices through the prices model. These prices, in turn, are key variables in the determination of final demand and sector incomes.

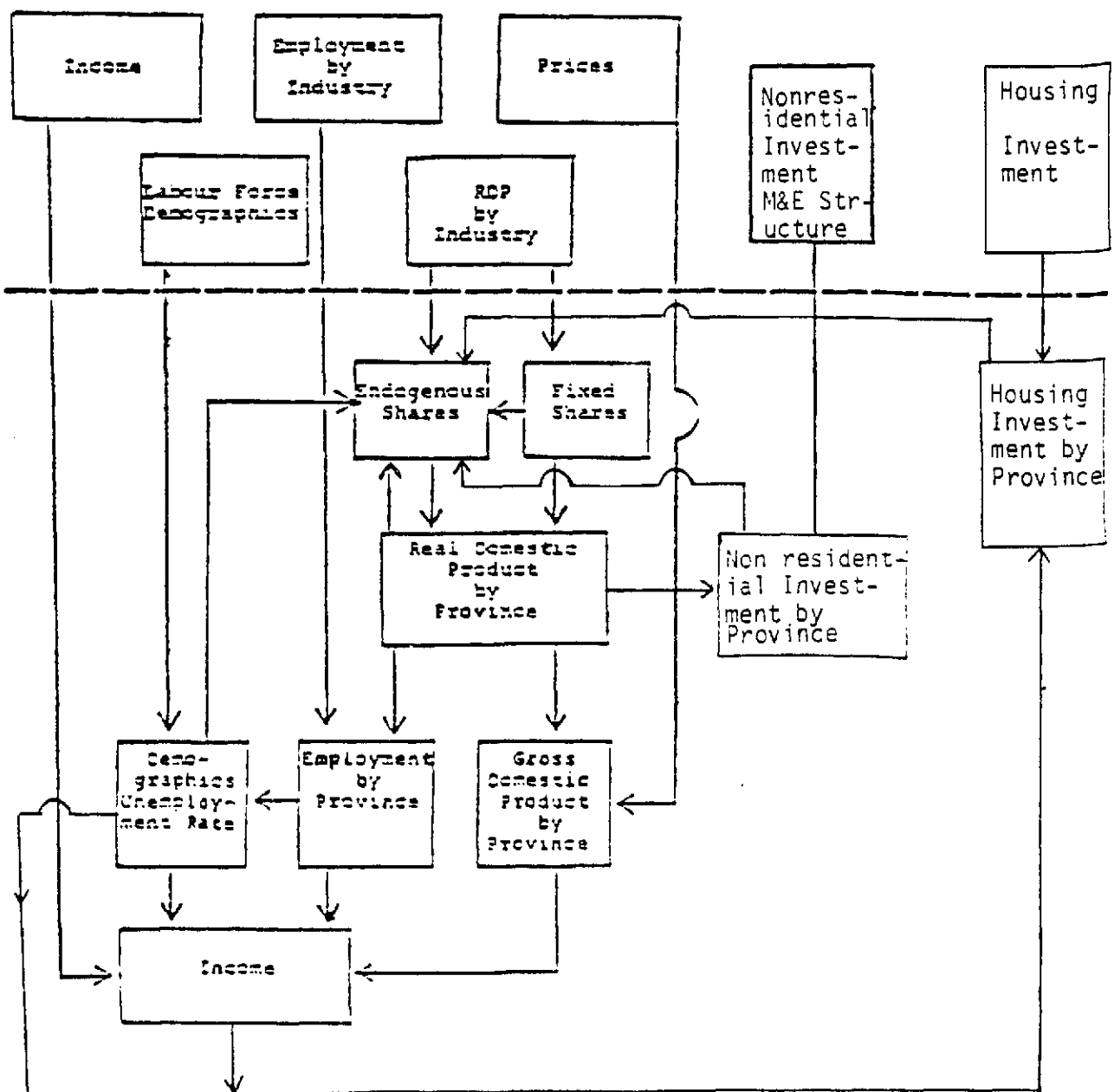
Consistent with the basic structure of the Statistics Canada Income and Expenditure Accounts, total income is also allocated to the four major economic groups or sectors--persons and unincorporated business, governments, corporations and the foreign sector. These incomes and the final demand prices are the major explanatory variables in the determination of final demand. Thus, one channel for the resolution of an impact is either directly or indirectly though the sector incomes and hence to final demand.

An integral energy sub-model is used to provide energy use, supply, price and revenue detail consistent with the rest of the forecast. Estimates of the structure of interest rates and capital flows are also provided in the financial blocks of the model.

STRUCTURE OF THE REGIONAL-INDUSTRIAL MODEL (RIM)

TIM

RIM



REGIONAL-INDUSTRIAL MODEL (RIM)

The Regional-Industrial Model (RIM), a formal "top-down" model, is used to provide the provincial dimension to the estimates of industrial activity, employment and income. Because of the availability of the sophisticated macroeconomic structure inherent in The Informetrica Model, TIM, the structure of RIM is focused directly on the regionalization of the detailed outputs from TIM. The major model flows are outlined in the RIM flow chart below.

The initial stage is the regionalization of the TIM forecasts for industrial output - Gross Domestic Product at constant prices - for 61 industries. In general, for these impacts, the regional shares of activity for most traded goods-producing industries are unchanged from their base case values. The major exceptions to this rule are primary sector industries, such as metal mining, whose shares have been altered because of detailed final demand responses in TIM. For example, the focus in B.C. is on copper, whereas the dominant metal in Ontario is nickel. In these impacts, the relative export responses of the various metal categories in TIM is used to vary the regional shares of metal mining. For example, the variation in fertilizer exports, i.e. potash, is the major determinant for Saskatchewan's share of non-metallic mineral output but does not directly affect the level of non-metallic mineral output in Ontario.

The assumption of stability of regional shares for other goods-producing industries, particularly manufacturing, is tenable because of the level of industrial disaggregation in RIM. For example, the differential impact of a change in interest rates on the demand for ships relative to the demand for automobiles is easily regionalized because both components of transportation equipment manufacturing are considered separately within the TIM/RIM framework.

The principal determinant of regional construction activity is, of course, residential and nonresidential investment. The national investment forecasts at the detailed industrial level are distributed to the regions using the regional estimates of GDP$K as the principal explanatory variables. Estimates are provided for 14 industrial sectors for investment, discards and capital stock for both non-residential structures and for machinery and equipment. The regional forecasts of housing starts are primarily a function of regional income, the vacancy rate and the housing stock. Estimates are provides for starts, completions and stocks for both singles and multiples for the 10 provinces.

The regional allocation of activity in the non-traded goods and services industries is determined by the regional level of households, aggregate income, GDP or some similar measure relative to the corresponding national level. For some industries, such as wholesale trade, some cross-region relationships are modeled.

Employment for 17 industries in each province is determined by relative regional productivity, national labour/output ratios and by the level of industrial output in each region. The provincial share of households is determined in the model principally as a function of that region's current and past employment share. The size of the provincial labour force is determined by the level of households or employment and the regional distribution of income.

Labour income is allocated using national income/output ratios and the regional distribution of industrial output. Nominal Gross Domestic Product is allocated provincially using national value-added prices and regional industrial output. Personal income in each province is the sum of labour income, unincorporated income and transfers from other sectors. Of the latter, UI benefits are regionalized using the relevant unemployment levels and rates. Other transfers are regionalized principally by the distribution of households or of income.

When comparing the national and regional results, it should be noted that only domestic concepts are used within the regional model. Therefore, the measure of corporate profits used excludes the impact of net foreign income flows. Similarly, the impact of a shock on Gross Domestic Product is not equivalent to that on Gross National Product because of these same flows, as well as because of the difference between a factor cost and a market price measure. Finally, the concept of labour income used in the regional model excludes military pay and allowances. However, these are included in personal income.