

Deregulation of Telecommunications in Canada and the U.S.

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Abstract

In the past twenty years, deregulation has been accepted and widely used in many industries. Deregulation is defined as the release of restrictions on the entry or exit from a market and the partial or total liberalization of prices. A number of policies were established to move industries such as airlines, telecommunications, and electricity from monopoly to competition. In recent years the changes in the telecommunications services industry have been rapid and substantial around the world. The telecommunications market in Canada has experienced dramatic development. The purpose of this paper is to review the literature on the impact of deregulation on the telecommunications industry. Important issues are discussed in this paper: competitiveness, cost and pricing, production, the development of the Canadian telecommunications industry and the regulation and deregulation in the U.S. telecommunications industry.

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1. Introduction

In the past twenty years, deregulation has been accepted and widely used in many industries. With the Telecommunications Act imposed in 1993 in Canada, deregulation suddenly spread in the telecommunications industry. Deregulation is defined as the release of restrictions on the entry or exit from a market. From the perspective of the growing interest in deregulation, economists and scholars explain the necessity of deregulation in terms of technology, economy and ideology. A number of policies were established to move industries such as airlines, telecommunications and electricity from monopoly or rigid government regulation to competition. The major reason is that regulators realized that the monopoly market structure is not effective any more.

In recent years the changes in the telecommunications services industry have been dramatic and substantial around the world, specifically, the transition from monopoly to competitive market. The Federal Communications Commission¹ (FCC), the courts and the Canadian Radio-television and Telecommunication Commission (CRTC) have achieved a reduction of regulation successfully and continually. The government is trying to increase competition in the telecommunications market mainly by removing the entry barriers for new entrants and weakening the power of incumbents.

¹ An independent agency of the U.S. government.

The telecommunications market in Canada has experienced dramatic and rapid development. According to the CRTC (2012), the total revenue in the Canadian telecommunications industry was \$42.7 billion in 2011, which shows the significant role of the telecommunications service industry in the Canadian economy. The U.S. telecommunications industry has also witnessed tremendous changes since the breakup of AT&T in 1984.

The Telecommunications Act of 1996 played a significant role in the history of telecommunications in the U.S. The purpose of the Telecommunications Act was changing and restructuring all telecommunications markets (i.e. from a natural monopoly to a competitive market). The Act aimed to reduce the regulatory barriers of the telecommunications industry to competition and facilitate entry (Economides, 1999).

The purpose of this paper is to review the literature on the impact of deregulation on the telecommunications industry. More specifically, this paper focuses on the Canadian and the U.S. telecommunications development after the lessening and reforming of regulations. The major issues discussed here are both regulation and deregulation in Canada, including some regulation approaches and the long distance competition in Canada. Another important part of this paper is the positive deregulation progress in the U.S. telecommunications industry. Moreover, this paper covers competitiveness, cost and pricing, production, and comparison with the U.S. Compared with the U.S., deregulation

has been much more successful in Canada (Crandall and Hazlett, 2000). The development of the telecommunications industry in Canada is a reference for various countries that are currently or will in the future consider deregulation.

Consumer products markets have been affected by deregulation in the telecommunications industry. As Gupta (2013) mentions, consumer welfare increased considerably following deregulation. In terms of products and services, the development of the telecommunications industry increased consumer welfare by reinforcing network and other externalities in a positive way. Also, consumers have benefited from the quality-adjusted prices, which have declined continually over the years. Both technological development and deregulation of the telecommunications industry lead to increased consumer welfare. Gupta (2013) classifies consumers into two categories. One consists of new consumers without a strong willingness to pay. Those consumers start spending money on products and services due to the lower prices. The other is made up of consumers who usually consume products and services, even at high prices. The benefits of these consumers have increased since they do not have to pay as much as before. Gupta (2013) concludes that a combination of increasing usage per subscriber and decreasing prices generated an increase in the quality of telecommunications services.

The rest of this paper consists of nine parts. In part two, we discuss the background of the telecommunications industry. The third part explains three aspects of why deregulation

happened. Part four goes over telecommunications industry competitiveness issues. Part five discusses the cost and price of telecommunications services. Part six shows telecommunications production issues. Parts seven and eight cover the development of the telecommunications industry in Canada and the U.S., respectively. For part nine, we compare the impact of deregulation in the telecommunications industry on the Canadian market with that on the market of the U.S. The last part is the conclusion.

2. Background

The telecommunication industry has played a leading role in Canada. Today, it remains a vital component of the Canadian economy as a whole. The industry's share of Canada's real GDP was 4.9% in 2011. The telecommunications industry ranked fifth in 2011 out of the 14 major service producing components of GDP, as listed by Statistics Canada.² The telecommunications industry increased the fastest (23.8%) and posted the largest nominal gain (\$163 million) in 2011 (Statistics Canada).

Telecommunication services can be separated into wireline and wireless services. In terms of revenue, wireline service revenues include local and access revenues, long distance revenues, data and private line, and Internet service revenues; while wireless

² Industry Canada, Information and Communication Technologies Statistical Overview (<http://strategis.ic.gc.ca/ictso>) Update: April 2005 ICT Sector Gross Domestic Product 2011 (in 2002 constant dollars).

service revenues is the sum of the terminal equipment revenues and the mobile service revenues.

The telecommunication service industry can be classified, in terms of market providers, as incumbents who provide telecommunications services on a natural monopoly basis prior to new competitors, competitors operating outside their traditional operating territory, and competitors that are not incumbent companies. The incumbents can be divided into large incumbents who serve relatively large areas, for example Aliant Telecom, Bell Canada, MTS Allstream, SaskTel and TCI, and small incumbents serving relatively small areas, such as NorthernTel. Furthermore, the telecommunications service industry is composed of large national facilities-based providers and small regional non facilities-based providers (Wong 2010).

The CRTC is an administrative organization created by the Parliament of Canada that regulates and monitors telecommunications and broadcasting in Canada. It was established in 1976. Before 1976, it was known as the Canadian Radio and Television Commission created by the Parliament of Canada. The CRTC regulates all telecommunications and broadcasting activities in Canada. The Telecommunications Act sets up the telecommunications policy objectives, which are administered by the CRTC.

CRTC (2012) reports the status of telecommunications and broadcasting industries in Canada, the impact of technological development on the telecommunications and broadcasting industries, and the effect of the regulatory frameworks in the year 2011. The report classifies the telecommunications service providers (TSP) into incumbent TSPs and alternative TSPs. The incumbent TSPs are companies with market power, which first introduced competition. Alternative TSPs can be divided into facilities-based alternative TSPs and non-facilities-based alternative TSPs.

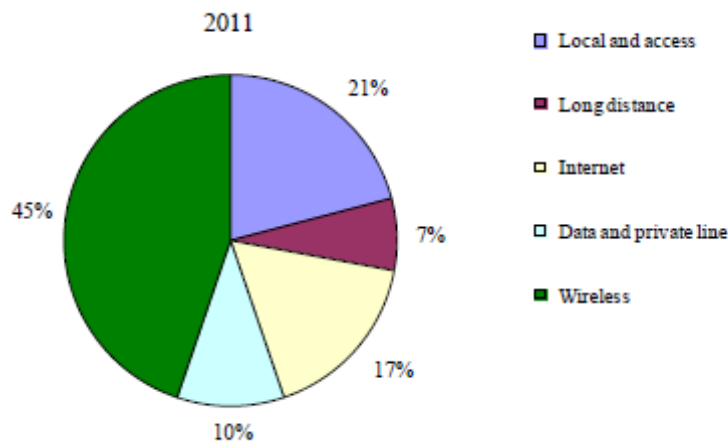
According to this report, the telecommunications industry can also be divided into four major market sectors, which are wireless, wireline voice (including local and access, and long distance), Internet and data and private line. Figure 1 shows the distribution of telecommunication revenues in 2011 according to the different market sectors. Wireless plays a significant role in telecommunication revenues (about 45%). Local and access account for 21%, Internet makes up 17% of revenues, data and private line account for 10%, while long distance represents 7% in 2011.

Telecommunications revenues in Canada increased 2.5%, from \$41.7 billion in 2010 to \$42.7 billion in 2011. This increase was due to a rise in revenues for newer data services and broadband Internet and wireless services³. The enormous contribution of the

³ CRTC (2012)

telecommunications services industry to the Canadian economy in terms of Gross Domestic Product (GDP) and product growth rate is obvious.

Figure 1: Distribution of telecommunications revenues, by market sector



Source: CRTC (2012)

3. Deregulation

The phenomenon of deregulation has been prevalent around the world over more than a decade. Concerning this, many economists and scholars continue to ask one popular question: why did deregulation happen and what is behind the continuing pressure to deregulate? Rubsamen (1989) evaluates three different aspects (i.e. technological, economic, and ideological) of the question.

With the development of technology, telecommunication has also developed a lot. Particularly due to digital transmission systems, telecommunication, office machines and

computers can converge to operate as a union. "These new products are referred to as 'enhanced' or 'value-added' services (VANS) and are distinguished from the 'basic' service of voice telephone" (P107, Rubsamen, 1989). Another goal is to implement the Integrated Service Digital Network (ISDN), through which the simultaneous transmission of images, words and voice is possible.

Rubsamen (1989) states that it is necessary to re-evaluate the current basic regulation in telecommunications. First of all, the natural monopoly exercised by state or private telecommunication companies should be questioned. Because of the new systems, existing networks' important parts can be duplicated and more competitive services can be provided. Secondly, the increasing cost of technology makes it more difficult to stave off the liberalization of the equipment markets. "It is too costly for national PTTs to rely only on traditional domestic supplies for switching equipment" (P107, Rubsamen, 1989). Furthermore, the pace of adaptation to innovation may result in the increase of indirect costs for national telephone monopolies while providing for customer demands. Moreover, it is difficult for national telecommunications monopolies to operate without some recourse to the market because of the new range of services. Finally, since the convergence of telecommunications and data processing made a distinction between the basic voice telephone service and enhanced services, American experience shows that the distinction between the basic voice telephone service and enhanced services is too

difficult to obtain. The reason is "competition in the latter as well as in terminal equipment has eroded the rationale for monopoly control over the basic service" (P107, Rubsamen, 1989). All this competition in enforced services and difficulty of distinguishing basic from enhanced services has resulted in demands for a big change in regulatory regime for telecommunication monopolies.

There is another way to explain the telecommunication deregulation in economics. "The economic explanation represented in the works under review focuses on the relationship between deregulation and the needs of multinational telecommunications and computer firms for markets as well as the demands for corporate and financial groups for cheaper and more sophisticated telecommunications products" (P107, Rubsamen, 1989). The purposes of deregulation in telecommunication are lower costs and choices of products. Low cost and methods of complicated data processing can bring extra benefits for firms. In Rubsamen's view (1989), the goal of deregulation is to strengthen American business firms, and allow AT&T and IBM to market products abroad.

In countries with public monopolies over telecommunications, several similar coalitions try to fight against deregulation. In Britain, the major reason for deregulation is that customers need a more efficient service; furthermore, IBM controls entry into the British telecommunications market.

Through the ideological explanation, deregulation leads to a change in the views of policymakers about the benefits of regulation. Rubsamen (1989) states that three major factors support deregulation. First, prices are high. Under regulation, because of poor management, services are backward and inefficient. Second, consumers become the victims when regulation exists; this was a common view of economists in the 1960s. Third, excessive regulation brings more complaints. Furthermore, Rubsamen (1989) mentioned, "The successful translation for reform idea into deregulation in telecommunications, trucking, and airlines was achieved by regulatory commissions, congressional committees, and the disintegration of industry opposition." (P109, Rubsamen, 1989)

4. Competitiveness

Although the telecommunications industry has been regulated in many countries, there has been a significant policy transformation over the past fifteen years. The Telecommunications Policy Review Panel (2006) by Public Works and Government Services Canada provides a view that the telecommunications sectors have been transformed in policy and regulatory frameworks in many developed countries, such as Canada. In particular, the Panel (2006) points out that the telecommunications sector has been reformed and transformed from monopoly service provider to the privatization of publicly owned firms and competitive markets. The changes have been successful since

countries attempted to introduce the principles of competition law that affect regulations. During this change and transition, much legislation is estimated to facilitate the improvement of the structure of the telecommunications industry smoothly and safely. The fact is the impacts of this change have been numerous and dramatic, especially in the telecommunications industry of developed countries, such as Canada. Instead of keeping the detailed, prescriptive and costly regulatory frameworks, Canadian policy makers reformed regulations in the telecommunications industry to deliver benefits to Canadians.

The Telecommunication Act in 1993 is a significant watershed in the telecommunications industry in Canada. Under the Telecommunication Act, the position of the telecommunication industry changed from a natural monopoly to a more competitive market. Crandall and Hazlett (2000) point out the following: "Canada has introduced competition in its telecommunications sector through the administrative decisions of its regulatory authority, the Canadian Radio-television and Telecommunications Commission (CRTC) under a new Telecommunications Act that allowed such liberalization, but did not require it." (P1)

Many scholars and observers indicate that the mobile phone sector is considered an uncompetitive market in Canada due to access. Age, income, education, and gender could be reasons that influence access. In fact, the mobile phone sector has spread more rapidly and widely than other telecommunications sectors. Thakur (2012) provides an insight into

the desired result of facilitating the competitive mobile phone market that regulation did not achieve. Thakur (2012) stated three conclusions about the competitiveness and the distributional consequences of the mobile phone sector in Canada. First, “an important factor in how policies can influence distributional consequences is the way in which competitiveness for the technology’s market is perceived” (P229, Thakur, 2012) Furthermore, the goals and extent of technological policy should fit the development of competition. Moreover, government policies can influence the distributional consequences of technologies without taking the scope and use into consideration.

According to Globerman et al. (1996), the recent policies intended to improve the competitiveness in local network distribution service in Canada were not appropriate. Compared with the economic conception of competition, non-economic competitive conceptions such as ‘fair’ and ‘sustainable’ competition have been perceived as the major objective of policy-making in Canada (Globerman et al., 1996). The CRTC published the regulation about competition on the public long-distance voice services, which is called “open competition” in 1992. The CRTC suggested that although there is removal of some barriers, they have also built up barriers to enter local distribution.

Over the period between 1968 and 1985, the Alberta Government Telephones (AGT) was definitely a typical case that represented the telecommunications monopoly in Canada. According to Gentzoglani (1993), AGT’s cost structure had natural monopoly

characteristics. The reason was that numerous cost savings would be realized if AGT produced the entire local and toll outputs alone. Thus, the deregulation of structure and competition might become inappropriate when policy makers decide to increase the allocative efficiency in AGT's market. Social welfare would not necessarily be increased, with overall costs increasing by the deregulation (Gentzoglanis, 1993).

Although the impact of competition in telecommunications policy is increasing, it becomes a hard challenge for decision makers and regulators. We say telecommunications markets are ineffective competition when incumbent providers lost power to sustain prices at a specific level. Hauge and Jamison (2009) conclude that there are two factors to be considered when one analyzes competition and market power: network effects and the role of regulatory intervention. As Hauge and Jamison state, effective competition disappears when the firm has market power. Mobile service is an appropriate example to support this perspective. As mentioned before, the mobile phone sector is perceived as an uncompetitive market. The monopolist would limit the number of customers to maximize their profit. This misallocation would result in inefficient competition in the mobile phone sector.

5. Cost and Pricing

Using telecommunications costing as the means for regulating in Canada began over the period between 1969 and 1996. As Bigham (1997) mentions, since Bell applied to increase its prices in 1969, the Canadian Transport Commission (CTC) claimed that both Bell's monopoly subscribers and its competitors were damaged with the emerging competitive services under the cross-subsidizing provided by its traditional monopoly services.

In 1972, the CTC then issued "Inquiry into Telecommunications Carriers' Costing and Accounting Procedures", i.e. "Cost Inquiry". In order to accomplish the "Cost Inquiry", three steps were needed. Phase I focused on the threshold accounting and financial issues for regulatory objectives. Phase II estimated expected revenues and costs related to a specific service or action. Phase III was designed to associate actual revenues and costs with a number of existing services. During this period, two categories were used to rate Canada's method of costing. One category is Access, which consists of costs related to the local loop and non-traffic sensitive facilities. The investment in these facilities is caused by the demand of subscribers for high performance of voice receiving or data transmissions. Another category is Common, which contains overhead and administration costs that cannot be associated with the production of other categories directly (Bigham, 1997).

In order to achieve the regulatory service costing purposes, at the outset two costing methods were considered. One is Bell Canada's 5-Way Split. Another one is the Revenue Settlement Plan (RSP). Breslaw (1988) stated that the 5-Way Split allocates costs by using computer simulation of the network to handle the required traffic, mainly based on growth-route/growth-technology assumptions. The RSP allocates costs by evaluating which facilities are actually used by each of the service categories, based on periodical data. The CRTC prefers the RSP due to the properties of its use. However, the preference of the Commission does not imply that the RSP costing methodology is much better than the 5-Way Split. The RSP costing method was chosen to be adapted in order to meet Phase III because it satisfies the audibility standard that was established by the Commission. It is necessary to adapt the RSP costing process if it is to be used for regulatory costing purposes. Also, moving specific services from monopoly to competitive categories, assigning excluded investment, and operating expense is required (Bigham, 1997).

There are three major factors that generate unit costs in telecommunications: changes in factor prices, technical progress and output expansion in production with increasing returns to scale (Denny et al., 1981). According to the paper, they specified and measured the extent and nature of technical change with concentration on the two most important innovations from 1952 to 1976. They conclude that factor price changes increase the unit

production costs, but changes in technical progress and increasing scales lead to reduction in per unit cost. Furthermore, the new technology diffusion is not considered as important as generally believed. Finally, the direct-distance dialing and switching technologies had different impacts on cost during the period. Both technological changes could play a significant role in reducing costs. They can either increase the percentage of customers connected to direct-distance dialing equipment, or increase the proportion of customers connected to modern switching equipment.

Instead of traditional rate of return regulation, price cap regulation has become one of the popular pricing regulations of the telecommunications industry. Specifically, the regulations imposed on the local telephony rates of incumbent local exchange carriers (ILECs) shift to price cap regulation. The impact of the price cap on the telecommunications industry is not obvious compared with the traditional rate of return. The reason may be the existence of tariffs. However, the ILECs have to face additional pricing constraints on many individual services (Beaudry, 2010). In order to estimate the optimality of regulated telecommunications prices, Breslaw (1982) established a pricing model of Bell Canada in the Quebec-Ontario region. Breslaw (1982) found that the price of residential and message toll services needs some changes even though the results of the pricing model did not address the transition from non-optimal prices to the optimal ones.

CRTC (2012) provides an insight into the telecommunications subscribers in Canada. In 2011, 91% of Canadian households subscribed to wireline voice communications services. CRTC (2012) also identifies two telecommunications service provider (TSP) categories: incumbent TSPs and alternative TSPs. The incumbent TSPs are the "companies that provided telecommunications services on a monopoly basis prior to the introduction of competition"(Appendix 2, P1). Large incumbent TSPs include Bell Aliant, Bell Canada, MTS Inc., Northwestel, SaskTel, T ébec, and TCC, which serve relatively large areas and provide a large number of services. Small incumbent TSPs are firms such as Northern Tel and TBayTel, which serve relatively small areas, usually in Ontario, Quebec and British Columbia, with limited services. Another category is alternative TSPs, which are divided into Facilities-based alternative TSPs and Non-facilities-based alternative TSPs depending on whether or not they own telecommunications networks.

Solvason (1997) did a cross-sectional analysis of residential telephone subscription in Canada. In order to describe the first cross-sectional analysis, he used a model named generalized extreme value (GEV). The assumption of GEV is the probability of the alternatives depending on the existence of the other alternatives. The results show that the largest substitution effect occurred between subscribing to zero line or one line. More specifically, if the possibility of not subscribing was not available, the probability of subscribing to one line would increase proportionately. Many factors impacted the

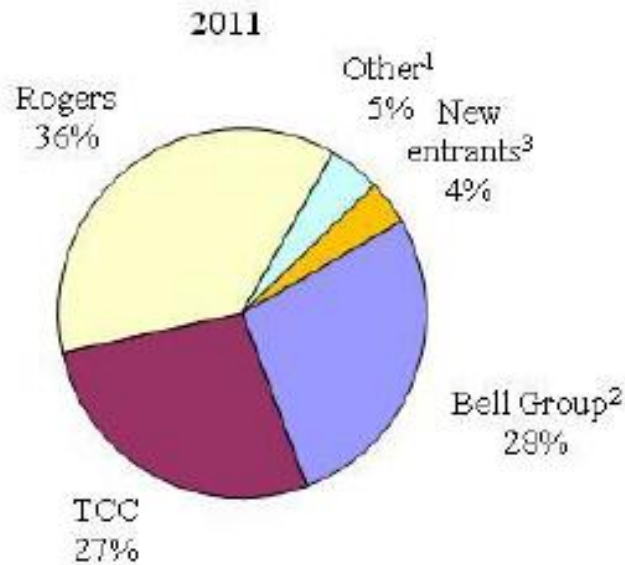
households' probability of subscription, including price, income, age, education, employment status, etc. The price has a negative relationship with the probability of subscribing to residence access service, but a positive relation exists between the probability of subscribing and income, age and education. The probability of having additional lines was affected by the monthly recurring price of access, the installation price and many other factors such as income or other devices. However, the GEV model found that the monthly recurring price of access and the installation price did not greatly affect the level of penetration in Canada.

According to the CRTC (2012), a wireless network is available to 99% of Canadians. Figure 2 shows that the three largest TSPs in the wireless market sector of Canada are Rogers (36%), Bell Group (28%) and TCC (27%). New entrants account for only 4% of the market.

Wireless carriers have to give up short-term revenue if they help subscribers save money by using the "Flex" plan. Wong (2012) provides a view about the subscribers' rate plan switching behaviour and furthermore an understanding of the financial implications of optimal plans for subscribers. Wong (2010) mentions that the "bucket" rate plan type is the major rate plan type that Canadian wireless carriers offered. This type contains a variety of plans with different prices and coverage charges. Each plan consists of monthly voice usage allowance and an additional per minute coverage charge if the actual usage

exceeds the allowance. The problem is that the unused minutes that are included in the bucket cannot be refunded or added for the next use. In order to minimize and save subscribers' monthly wireless expense, a new type of data plan, the so-called "Flex", was introduced by Canadian wireless carriers. This plan, however, is inappropriate for the "bread-and-butter" wireless voice services (Wong, 2010).

Figure 2: Wireless TSPs' subscriber market share



Source: CRTC (2012)

Wong (2010) mentions that subscribers with optimal plans account for around 50% less revenue than those with non-optimal plans even though the Canadian wireless carriers believe loyal subscribers are more profitable. This result encourages carriers to sacrifice current revenue if they want to obtain customer loyalty. The result also shows the difficulties the Canadian wireless telecommunications sector faces, including new

entrants, high subscriber acquisition costs, and similarity of network coverage and features. Wong also states that wireless carriers could gain more profit through changing the rate plans often and updating subscribers' equipment. From the wireless subscribers' standpoint, they should be aware that they overpay for service because of financially non-optimal rate plans.

6. Production

Multiple-product technology is the typical model of Canadian telecommunications production. Numerous hypotheses and models have been constructed and established in order to explain the economic process and to estimate the growth of the telecommunications industry. The most popular test divides the equilibrium between the short run and long run.

6.1 Long Run Equilibrium

In the telecommunications service sector in general, econometric analysis assumes that carriers are in the long run equilibrium. This assumption suggests that carriers could determine long run factor demand immediately since all factors of production can be adjusted at no cost. Bernstein (1989) concentrates on the long run equilibrium for Bell Canada. His conclusion is that Bell Canada was not in the long run equilibrium, and the test of capital with no adjustment costs was also rejected.

Although various types of equilibrium are estimated for Bell Canada, only three types of equilibrium were examined. Moreover, the differences in the role of investment in the equipment and structure were examined too. Bernstein (1989) shows that an additional cost of \$0.30 to introduce new capital into the production process was incurred for \$1.00 of marginal capital costs. Because of the adjustment cost, the capital stock for Bell Canada was about 10 percent below its long run level. Productivity growth was estimated and the common average annual rate of production growth for Bell Canada was 1.32 per cent. More specifically, Bell Canada did not reveal cost complementarities but exhibited increasing returns to scale. A reason for the existence of increasing returns to scale is a small effect of toll output on variable production cost. According to Bernstein (1989), the substitution possibilities between the factors of production were affected by adjustment cost. Specifically, labour and materials were substitutes in the short run, but they were complementary factors when adjustment cost equals zero.

6.2 Total Factor Productivity Growth

Total factor productivity (TFP) is typically used to explain the impact of productivity growth on total production, which usually appears in the multi-factor productivity or Solow residual. Fuss (1994) estimates total factor productivity growth for Bell Canada and B.C. Tel. He also uses the conventional Törnqvist (Divisia) formula that determines the growth rate of output by weighing the revenue shares of outputs. In Canada, the

prices of toll services are higher than marginal costs while local services prices are lower than marginal costs. In fact, Fuss (1994) states that the growth rate of output should be determined by weighing the cost elasticity instead of weighing the revenue shares of output.

Other economists estimate the effect of total factor productivity on the telecommunications service industry. For example, Nadiri and Schankerman (1981) estimate the multi-effect of technical change and scale economies on total factor productivity growth. In their opinion, the degree of returns to scale has been one of the competitive elements in the telecommunications sector in the Bell System.

6.3 Vertical Integration

In the U.S. and Canada, the strategy of vertical integration in telecommunication has been a hot topic. Babe (1981) provides a productivity comparison of integrated and non-integrated telephone companies in Canada. Furthermore, Babe (1981) provides his own perspective on the net impact of vertical integration on the telephone operation. Studies about the effect of vertical integration of telephone companies have not been undertaken in the U.S. due to the U.S. telephone industry's structure. By contrast, studies about the net impact of vertical integration on Canadian telephone companies have been carried out, as discussed by Babe (1981). The paper shows that non-integrated telephone companies achieved substantially more productivity gains than the integrated companies.

There are three reasons mentioned by Babe (1981) to explain why there are discrepancies in the contribution of productivity between vertically integrated telephone companies and non-integrated ones: economies of scale, differential gains in productivity and entry into more profitable sectors.

7. The Development of the Telecommunications Industry in Canada

Public Works and Government Services Canada (2005) provides insight on the Canadian telecommunications regulatory framework, classified into three types of telecommunications regulations: economic, technical and social regulation. Economic regulation refers to regulation which "governs market behaviour, including prices and other terms and conditions under which telecommunications services may be provided by service providers" (P10, Public Works and Government Services Canada, 2005). Technical regulation "governs standards for equipment, radio spectrum usage and radio communication facilities, interconnection standards and other technical matters" (P10, Public Works and Government Services Canada, 2005). Social regulation "covers such matters as consumer protection, promoting universal service and affordable access and facilitating access for all members of society, including persons with disabilities" (P11, Public Works and Government Services Canada, 2005). Under the Telecommunications Act, as Beaudry (2010) mentions, economic regulation is primarily directed at incumbent local exchange carriers (ILECs).

Since 1997, the telecommunications industry has switched from the traditional rate-of-return regulation to price-cap regulation. In fact, compared with the impact of rate-of-return regulation, the effect of price-cap regulation was not obvious at first.

According to Jamison (2007), policy makers consider rate-of-return regulation as a tool that determines prices for the outputs by utility companies. The monopolies have to charge the same price that would be charged in a perfectly competitive market, which equals the combination of the efficient costs of production and a rate of return on capital. In the early 20th century, rate-of-return regulation played a major role in the telecommunications services industry in Canada. Under rate-of-return regulation, prices would be fair and reasonable and customers would not have to pay unnecessary prices. However, some scholars claim that companies would operate less efficiently under this form of regulation.

Rate-of-return regulation has played a significant role in regulating utility companies's rate base, operating expenses, and so on (Jamison, 2007). There are several advantages of traditional rate-of-return regulation. Firstly, investors can be protected from the arbitrary lowering of prices by regulators. In other words, the risk of investment is minimized and the cost of capital is reduced. Moreover, the hostility to monopoly is decreased due to rate-of-return regulation. In retrospect, the anti-monopoly and anti-trust law was particularly prevalent in the early 20th century (Jamison, 2007). The establishment of

rate-of-return regulation changed the situation of government, public providers and some companies.

Although some problems were relieved by rate-of-return regulation, there are some disadvantages of this type of regulation. As Jamison (2007) mentioned, the first is that with rate-of-return regulation it is hard to provide incentives for companies to operate efficiently. One well-known problem is the Averch-Johnson effect, which is the trend of regulated companies to use excessive amounts of capital accumulation in order to gain more profits. Another problem is the inefficient operation implemented by managers with fewer incentives. The last problem is that costs are likely transferred from competitive to noncompetitive markets.

Price-cap regulation is considered to be much better than rate-of-return regulation. Compared with the latter, price-cap regulation is used to protect consumers as well as producers (Jamison, 2007). The Canadian telecommunications services industry has operated under price-cap regulation since January 1998. As Jamison (2007) mentions, price-cap regulation was designed in the 1980s by UK Treasury economist Stephen Littlechild, and has been applied to all of the privatized British network utilities.

The X factor is defined when the price rate of the firm's inflation measured production decline (Bernstein and Sappington, 1998). The choice of magnitude of X factor is crucially significant to the long-term implementation of price-cap regulation. More

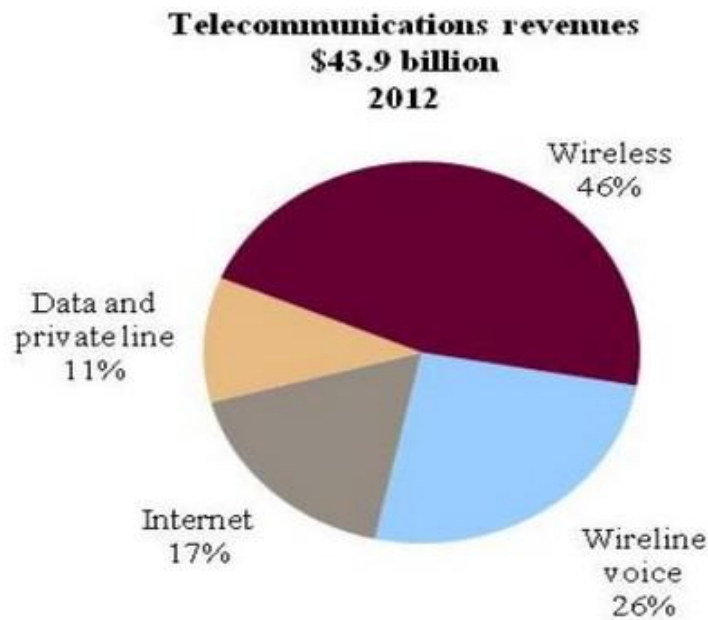
specifically, if a small X factor is selected, excessive profits are gained by the regulated firm; if the government chooses a large X factor, profits are hard to maintain. Under price-cap regulation, Jamison (2007) states, a regulated firm could improve its ability to exist and develop, depending on the X factor set by the regulator. There are two basic approaches in terms of choosing X: the historical and forecast methods. The historical approach indicates the difference between the regulated firm and the average firm in terms of Total Factor Productivity. A proper implementation of price-cap regulation is able to distinguish the long run and the short run terms in Total Factor Productivity. Another approach, the forecast method, is a three-step process to choose the X factor. In the first step, the rate base of year t should be determined. And " the next step is to project cash outflows, operating expenses, and non-operating expenses, and unit sales for each year of the new pricing regime." (P8, Jamison, 2007). The last step is to find the X factor.

Much attention was focused on deregulation in the telecommunications industry in Canada since 1992. The telecommunications industry was transformed from natural monopoly to competition when the CRTC allowed competitors into the long distance markets in 1992.

The telecommunications industry has made achievements in recent years. In 2012, the total annual revenues of the telecommunications industry were \$43.9 billion. As Figure 3

below shows, wireless accounts for 46% of the revenues, and data and private line represent 11% only.

Figure 3: Telecommunications Revenues in 2012



Source: CRTC (2013)

The telecommunications industry has experienced special treatment in the past. However, the enactment of the Telecommunications Act of 1993 changed this perception. The telecommunications industry in Canada transformed from a government-owned and company-operated monopoly to a private sector including resellers and carriers in a more competitive market. Public Works and Government Services Canada (2006) believes that

over the past two decades most Canadian telecommunications markets have transformed into competition.

It is commonly understood that the Canadian long distance market developed slowly until 1992. Canada facilitates competitor entry into the long distance market through interconnection between networks, which is different with the method used in the U.S.

In the early 1980s, the CRTC decided to reform and deregulate the Canadian telecommunications sector in terms of terminal equipment, resale and cellular services. According to the Telecom Decision CRTC 90-3, the CRTC concluded "that the resale and sharing rules should be amended to permit the resale of private lines for joint use for voice purposes" (CRTC, Telecom Decision 90-3, P37). On June 12, 1992, the decision on competition in long distance telephone service came into operation. In the decision, the public interest must be the primary purpose of competition in providing long distance telephone service. The detail about this decision is explained in the Telecom Decision 92-12. The CRTC mandates that all certified entrants have equal rights, which allow them access to the long distance market without any extra barriers from the incumbents.

The reform of the structure of the long-distance telecommunications market from a natural monopoly market to a competitive market was necessary. As stated by the CRTC (Telecom Decision 92-12), while a regulated market could lead to high prices, limited choice and low supplier responsiveness and service quality, competition will result in

larger choice, supplier responsiveness and lower price, and better service if new entrants are allowed to participate and to share the market with incumbents. The benefits of customers are maximized by choosing the most appropriate supplier, stimulating pricing service packages, and lowering long distance phone rates.

Table 1: Canadian Long-Distance Market Shares, 1995-98 (Percentage of Minutes)

<i>Company</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999 (Q2)</i>
Former Stentor (Incumbent) Companies	78	71	66	64	65
AT&T Canada	8	11	12	10	-
Sprint Canada	8	11	14	12	-
Others	6	6	7	14	-
Total Non-Incumbents	22	28	33	36	35

Sources: 1995: Stentor Hearings Evidence in CRTC Forbearance Proceeding; 1996-98- Call-Net Interrogatory Responses in CRTC 99-5.

Source: Crandall and Hazlett (2000)

The impact of competition on the long distance market is also apparent in terms of market shares. As Table 1 shows, the incumbent carriers' market shares in the Canadian long-distance market have declined gradually, from 78% in 1995 to 64% in 1998. On the other hand, total non-incumbents' long-distance market shares have increased rapidly. More specifically, total non-incumbents accounted for only 22% in 1995, but jumped to 36% after three years.

Implementation of long distance competition in Canada was successful, even though the liberalization in Canada started about two decades later than MCI⁴ in the U.S. did.

⁴ An American telecommunications company.

8. Deregulation in the U.S. Telecommunications Industry

The modern telecommunication regulation can be dated to the invention and improvement of the telegraph in the mid-19th century. Telecommunications services such as telegraph and telephone have been regarded as a natural monopoly to be supplied by the public sector. However, the situation has changed so that the telecommunications facilities and infrastructure can be operated by the private sector. In the early 20th century, the telecommunications services industry in the U.S. was regulated and primarily operated by government, with little competition in the market. Later in the 20th century, the government pursued a deregulation policy of telecommunication services and tried to reduce the restrictions on the telecommunications service industry.

The Telecommunications Act of 1996 ("Act" or "1996 Act") was signed into law in February 1996. The objective of the Telecommunications Act is opening the telecommunications industry to competition. More specifically, the "Act" removes the artificial barriers for competitors to enter local exchange markets. Furthermore, it improves competitors' ability to compete. Its stated purpose is "to provide for a pro-competitive, deregulatory national policy framework designed to accelerate rapid private sector deployment of advanced telecommunications and information technologies and services to all Americans by opening all telecommunications markets to competition." (Telecommunications Act of 1996 Conference Report, 104th Congress 2nd

Session, Report 104-458, P1). The Telecommunications Act became possible due to the advanced technology. After the breakup of AT&T, the Act tried to open up all telecommunication sectors into competition.

Ameritech, Bell Atlantic, BellSouth, SBC and USWest (or RBOCs) account for 89% of telephone access lines, while the majority of the remainder belongs to GTE. RBOCs were not allowed to enter the long distance market due to the property of RBOCs, i.e., the monopoly. Most scholars and economists claim that the RBOCs would undertake a number of anti-competitive actions if they were allowed entry into the long distance market. For this reason, the "Act" does not permit RBOCs to enter the long distance market unless the application is considered to be in the public interest. The requirement has been met only if the local market of the telecommunications industry is sufficiently competitive under the public market proposal.

There are two types of long-distance carriers: resellers and facilities-based. The number of these two types of carriers has increased enormously. Over the period between 1984 and 1995, AT&T was regulated by a price-cap regime and a requirement to file tariffs. Crandall and Hazlett (2000) mention that, "the combination of price caps and tariff-filing requirements provided a convenient mechanism for tacit collusion among the three largest carriers, AT&T, MCI and Sprint." (P8). Table 2 shows the market shares of U.S. long-distance carriers during the thirteen years from 1984 to 1997. From this table, it is

not hard to see that both MCI and Sprint's market shares have experienced slow growth since the price-cap implementation. Before 1991, specifically, both MCI and Sprint's market share of long-distance carriers in terms of total revenues grew about 13.9%. But after 1991, the growth of MCI and Sprint's market share slowed. For AT&T, the market share shrank from 81.9 percent in 1986 to 63.2 percent in 1991, with only a 17.7% market share decline from 1992 to 1997, which is slower than that before 1991.

Table 2: the Market Shares of U.S. long-distance carriers

<i>Year</i>	<i>AT&T</i>	<i>MCI</i>	<i>Sprint</i>	<i>WorldCom</i>	<i>Others</i>
1984	90.1	4.5	2.7	--	2.6
1985	86.3	5.5	2.6	--	5.6
1986	81.9	7.6	4.3	--	6.3
1987	78.6	8.8	5.8	--	6.8
1988	74.6	10.3	7.2	--	8.0
1989	67.5	12.1	8.4	0.2	11.8
1990	65.0	14.2	9.7	0.3	10.8
1991	63.2	15.2	9.9	0.5	11.3
1992	60.8	16.7	9.7	1.4	11.5
1993	58.1	17.8	10	1.9	12.3
1994	55.2	17.4	10.1	3.3	14.0
1995	51.8	19.7	9.8	4.9	13.8
1996	47.9	20.0	9.7	5.5	17.0
1997	44.5	19.4	9.7	6.7	19.6
1997	43.1	[Acquired by Worldcom]	10.5	25.6	20.8

Note: Excludes local-exchange carriers' long-distance revenues, but includes both intrastate and interstate revenues of long-distance carriers. Source: FCC (1999a).

Source: Crandall and Hazlett (2000)

The development of terminal equipment plays a significant role in the growth of the economy. "Terminal equipment" is defined as the customer's end of the transmission lines of the telephone network that permit and facilitate the transmission or reception of voice or data communication. "Terminal equipment includes (among other things)

residential telephones, key (or button) telephones, dialers, answering devices and PBX (private branch exchange) equipment.” (P410, Trienens, 1981)

Any foreign attachment or substituted devices that are not furnished by the local telephone company are forbidden for the purpose of the integrity of the telephone network. A study by Trienens (1981), *Hush-A-Phone Corp. v. U.S.*, is a good case to study the challenge of breaking the restriction. “Hush-A-Phone was a cup-like device which could be physically fastened to the mouthpiece of a telephone handset to increase privacy of conversation.” (P410, Trienens, 1981) Although the attachment is still not allowed entry by the FCC according to the Carterfone decision, some tariff changes by the telephone companies allow a device that is inoffensive for the operation of the telephone system or the safety of the telephone company employees or the public (Trienens, 1981). According to Trienens (1981), the Carterfone are defined as “The Carterfone device was used to interconnect the public telephone system and private mobile radio systems by means of acoustic and inductive coupling.”(P411)

The unregulated interconnect industry where consumers are free to choose equipment began to compete with the telephone industry regulated by the FCC in the end of the 1970s. During this time, the telephone companies were fully regulated, while the interconnect industry was free to compete in the market. The FCC allowed terminal equipment to be free from traditional regulation in the Second Computer Inquiry. The

Second Computer Inquiry is the result of the examination that exam the relationship between computers and communications carriers, supervised by the FCC (Trienens, 1981). The Second Computer Inquiry was issued in May 1980 but the impact did not show until July 1980. As Noam (1983) stated, during the same time, the deregulation of terminal equipment, which is the whole component of the Commission's expanded policy of extensive entry decontrol, emerged with various Commission's policies, which carried out in other areas and differed from State policies. Subsequently, the FCC made another reform policy. In order to enhance unregulated services, deregulate new terminal equipment, and free the new equipment from state tariffing, they permitted telephone carriers such as MCI and AT&T Inc. Thus, in order to meet the requirement of the reform of FCC, AT&T separated these activities structurally from its regulated activities. According to the rule designated by the FCC, terminal equipment is called "customer premises equipment" or "CPE", which is subject to the FCC's jurisdiction (Trienens, 1981).

As introduced before, the telecommunications service industry was dominated by AT&T, which accounted for about 90% of the market. During this period, unions negotiated wages for their members that were much higher than the wages received in the other unregulated industries. However, this situation changed in 1984, when AT&T was broken up. Under deregulation, with the accelerated competition labor earnings experienced a

downward trend. During deregulation, unions undertook a huge challenge because of the absence of the bargaining advantages when they negotiated wages for their members. The influence of deregulation in the telecommunications services industry on the labor market not only limited the rights of unions but also lowered the costs for new and non-union firms who were able to enter the market (Peoples, 1998).

There are two significant unions to mention when we study the U.S. labor market. The largest is the Communications Workers of America (CWA), which is the largest communications and media labor union in the U.S., representing about 550,000 members in both the private and public sectors. The second largest union is the International Brotherhood of Electrical Workers (IBEW). These unions have strong power in the labor market environment. Moreover, IBEW is working for workers in the electrical fields, such as computers, telecommunications, and broadcasting (Peoples, 1998). However, union leverage was sharply reduced with the introduction of the new labor saving technology and the expansion of market share of the non-union firms. The relationship between economic deregulation and the labor market is obvious from Table 3 below.

It is apparent in this table that the union membership rate in the telecommunications industry experienced a downward trend from 1973 to 1996. It declined from 55% in 1983 to 29% in 1996 due to the break-up of AT&T and the deregulation of long-distance services. Another reason for this large drop is the introduction of labor saving technology.

The number of workers shows an upward trend from 1,060,000 in 1983 to 1,126,000 in 1996. Weekly earnings show an upward trend from 1983 to 1996. The highly skilled workers who need higher wages are the major reason of the upward tendency (Peoples, 1998). From this table, we know the bargaining power of unions decreased with the competition of new entrants and non-union firms after deregulation in the telecommunications industry.

Table 3: Unionization, Employment and Labor Earnings Patterns in Transportation and Telecommunications Industries

<i>Industry</i>	<i>1973</i>	<i>1978</i>	<i>1983</i>	<i>1988</i>	<i>1991</i>	<i>1996</i>
<i>Trucking</i>						
Union Membership Rate	49%	46%	38%	25%	25%	23%
Work Force Size (×1,000)	997	1,111	1,117	1,544	1,617	1,907
Weekly Earnings (1983/84 dollars)	\$499	\$491	\$404	\$386	\$405	\$353
<i>Railroad</i>						
Union Membership Rate	83%	79%	83%	81%	78%	74%
Work Force Size (×1,000)	587	580	428	363	286	282
Weekly Earnings (1983/84 dollars)	\$475	\$491	\$507	\$490	\$494	\$470
<i>Airlines</i>						
Union Membership Rate	46%	45%	43%	42%	37%	36%
Work Force Size (×1,000)	368	465	464	683	696	800
Weekly Earnings (1983/84 dollars)	\$499	\$498	\$455	\$420	\$443	\$435
<i>Telecommunications</i>						
Union Membership Rate	59%	55%	55%	44%	42%	29%
Work Force Size (×1,000)	949	1,075	1,060	1,114	1,107	1,126
Weekly Earnings (1983/84 dollars)	\$399	\$442	\$457	\$447	\$458	\$488
<i>All Other Industries</i>						
Union Membership Rate	23%	22%	19%	16%	15%	14%
Work Force Size (×1,000)	72,619	81,737	85,220	97,704	99,080	107,844
Weekly Earnings (1983/84 dollars)	\$399	\$363	\$301	\$310	\$322	\$334

Source: Information on union membership rates and industry work force sizes were provided by Barry Hirsch and David Macpherson. Information on labor earnings for the 1973–1991 sample period are taken from Current Population Survey Files and the 1996 earnings are taken from Hirsch and Macpherson's Union Membership and Earnings Data Book (1997a). The sample years from 1978 to 1996 cover the post-deregulation period for trucking, railroads and airlines. The years 1983–1996 cover the post-divestiture period for telecommunications.

Source: Peoples (1998)

9. Comparison with the U.S.

It is not uncommon for economists and scholars to compare the telecommunications industry of Canada with the U.S. Although these two countries share numerous similarities, there are observable differences. More specifically, researchers are concentrated on comparing the effect of regulation and deregulation of telecommunication industry between the two countries, as well as the effect of the Canada-U.S. Free Trade Agreement.

Crandall and Hazlett (2000) state that the monopoly market structure began to be replaced by a more competitive market structure after the Act of 1996. In the U.S. market, the monopoly market structure was no longer effective. In order to change this situation, regulators phased in a competitive market. The traffic and restrictions for new competitors into local and long distance telephony were removed and transitional mechanisms were used to accelerate the move to the competitive market in the U.S. In Canada, competition was introduced by the CRTC more than twenty years after this process began in the U.S.

As Crandall and Hazlett (2000) mention, the Telecommunications Act in 1996 successfully promoted entrants into local telecommunications market at a rather slow rate. However, the Act of 1996 did not permit the Regional Bell Operating Companies

(RBOCs) to enter the long-distance market. Therefore, the development of interexchange competition in the telecommunications sector was slow. By contrast, Canada achieved faster growth of long distance competition than the U.S. since the telephone market was not separated into local and long-distance markets.

Crandall and Hazlett (2000) also conclude that the 1996 U.S. Act has been working relatively well compared with previous U.S. telecommunications laws, with customers having choice between suppliers. Moreover capital markets imply that competitive forces will intensify in the future. Problems that occurred with the Cable Acts in 1948 and 1992 have not arisen with the 1996 U.S. Act.

Armstrong et al. (2002) indicate that there was a negative relationship between the capital formation in information and communication technology (ICT), including consumption of computer software, computer hardware, and equipments, and the prices of high-tech equipment. Both investment and substitution affected capital quantity growth, but "most of the recent investment boom has been associated with substitution across assets as the relative price of high-tech assets steadily fell" (Armstrong et al., 2002, P1). The conclusion is that ICT was the main contributor to the growth of production in Canada, but Canadian productivity still cannot catch up with the U.S.

The Canada-U.S. Free Trade Agreement was signed in 1988 between Canada and the U.S. The FTA had an increasing impact on the telecommunications industry in both countries. Globerman and Booth (1989) analyze the direct and indirect impacts of the FTA on the telecommunications industry. They mention that most potential important impacts of the FTA were indirect. In both regulator and carriers' perspective, it is likely to reduce real tariffs while carriers would be more flexible. There were incentives for business subscribers to shrink telecommunications costs by arbitraging prices in both countries due to the reduced trade barriers. Canadian regulators tried to prevent one international "bypass" because it would threaten the Canadian carriers.

10. Conclusion

Deregulation has received much attention from economists and scholars around the world. This paper discussed the literature analyzing regulation and deregulation in the telecommunications industry in both Canada and the U.S.

The main reason for the rapid development of the telecommunications industry is the tremendous growth of technology. "The economic explanation represented in the works under review focuses on the relationship between deregulation and the needs of multinational telecommunications and computer firms for markets, as well as the demands for corporate and financial groups for cheaper and more sophisticated

telecommunications products" (P107, Rubsamen, 1989). Moreover, the determination of policymakers is another important factor behind deregulation in the telecommunications industry.

We reviewed the regulations in the telecommunications industry in Canada, including rate-of-return and price cap regulation. These two regulatory methods played a significant role in the Canadian telecommunications industry. The Canadian telecommunications industry has witnessed an enormous change since deregulation was implemented. The Telecommunication Act of 1993 is a milestone in the history of the Canadian telecommunications industry. The long distance market has changed, not only in competitiveness but also in market shares (the Telecom Decision 92-12). Although it is not easy to measure the degree of deregulation, the reform of the structure of the long distance telecommunications market in Canada was successful. The incumbent carriers' market shares have shrunk but the non-incumbents' market shares have increased.

Another significant part of this paper is the review of the U.S. telecommunications industry, from regulation to deregulation. The Telecommunications Act of 1996 attempted to restructure the U.S. telecommunications industry. The Act facilitated entry into the telecommunications market without extra barriers. After the breakup of AT&T, the purpose of the Act of 1996 moved to facilitating and transforming all the telecommunications sectors into competition. In terms of the long distance service, the

Act of 1996 limited RBOCs' entry into this market unless the purpose of RBOCs is in the public interest.

Speaking of terminal equipment, the improvement of terminal equipment is one of the most remarkable results of the reform of regulation in the telecommunications industry. The FCC allowed terminal equipment to be free in the Second Computer Inquiry.

The enormous change in the U.S. labor market is another prominent result caused by the deregulation in the telecommunications industry. Particularly, the rights of unions were limited and the wages of skilled workers were increased.

Comparing with the U.S., the reform and innovation of policy in the telecommunications industry seems less intensive and more successful in Canada. The evaluation of the Canadian telecommunications industry can be seen as a reference for other countries that are considering deregulating.

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