

Regulation in Telecommunication Industry

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Abstract

It is commonly known that industries such as water/gas supply, airlines, electric power and telecommunications act as natural monopolies because of economies of scale. Incumbents can often control resources to prevent new competitors and charge higher than competitive prices. Especially, telecom firms often have high market power due to high entry barriers, leading national governments to control them via regulations. On the other hand, new entrants in telecom industry usually own advanced technologies which give them a competitive edge. The competition between incumbents and new firms, mostly traditional fixed-line service versus rising mobile service, attracts regulators and scholars' interest. The issue of how to regulate a competitive industry emerges. The purpose of this paper is to introduce several regulatory approaches and examine how regulations work effectively in the telecommunication industry via a literature review. In addition, the author selected four countries, which are China, UK, Germany and Canada to examine the effect and development of regulations in their telecommunication industry.

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1. Introduction

There are two main reasons to study regulations in telecommunication industries. First, telecommunication is no longer a pure monopoly industry after the regulators of most OECD countries allowed some entry liberalization since the 1990s (Duso & Seldeslachts, 2009). Second, telecom industries provide positive externalities to society. Telecommunication is a fundamental component of an industrialized economy since it saves time consuming activities and transaction costs for other industries (Röller & Waverman, 2001). Therefore, for regulators, the policy of liberalizing entry into the telecom industry not only suppresses the monopoly market power, but also encourages competition between incumbents and potential entrants, which stimulates innovation.

Several empirical studies show that during lobbying different interest groups try to take a dominant position by capturing regulators to satisfy their needs (Kroszner & Strahan, 1999; Duso, 2005). This philosophy could be seen on various players in telecom industry as well. If each player in the market, i.e. consumers, incumbents and potential entrants has equivalent political power, the policy-maker would generate fair and balanced regulations. It would not be biased towards any player and will maximize the social welfare. However, because of imperfect information, the regulator may be affected by the group with higher political influence (usually incumbents). Also, the imperfect information is a serious issue that each government needs to deal with. We will see how it plays a crucial role in the telecom industry. In order to maximize social welfare and control the profits that firms earn, policy-makers use several approaches to regulate the telecom industry.

The goal of this paper is to review regulatory approaches/instruments, and examine some country-specific experiences in regulating the telecom industry. The paper is organized as follows. In section 2, we introduce three regulatory approaches and discuss the advantages and limitations of each. In section 3, we will examine some specific issues in this field through a partial literature review. In section 4, we will study the regulatory cases in four countries by taking a historical view of their regulations. Lastly, the conclusion will summarize the entire paper's ideas and evaluate the process of regulatory evolution.

2. Common Regulations for Policy-Makers

In this section, we will go over three commonly used regulatory approaches. Although they were used for a long period by regulators in different industries and countries, each has its own limitations.

2.1 Rate of Return Regulation (ROR)

ROR is one of the oldest regulatory approaches. This method has been applied extensively to regulate utilities in many countries for over 100 years. With this method, firms' profit is restricted to a certain level of return in proportion to capital (Laffont & Tirole, 2000). The rate of return is set by regulators, which they consider as a fair rate of return for firms. This instrument successfully achieves the goal of limiting firms' profits. Before utility regulation, monopolies used to limit the output of goods and services provided to the market so they could raise prices and make higher profits. However, with ROR, the profit that the firm can earn is controlled by the government in order to satisfy more customers. Moreover, regulators choose the rate of return based on the necessary capital investment in future periods. Thus, ROR is a powerful tool to enhance social welfare.

Yet ROR has its own limitations. Since firms seek higher profits, with a determined rate of return on capital, they have a tendency to increase the capital/labour ratio, resulting in inefficient input choices. By abandoning the optimal capital investment, ROR can increase inefficiency in the industry. Averch and Johnson firstly studied this issue in 1962 and this dilemma is called the Averch-Johnson effect (Braeutigam & Panzar, 1993).

The mathematical formulation of the Averch-Johnson model is as follows.

The firm maximizes its profit: $\pi = R(L, K) - wL - rK$

subject to: $R(L, K) - wL \leq sK$

where:

π is profit

R is the revenue function

K is the quantity of capital

L is the quantity of labor

w is the wage rate

r is the cost of capitals

s is the rate of return set by regulators

By setting up the Lagrangian function and solving the first order conditions, we obtain the equilibrium condition:

$$\frac{MP_K}{MP_L} = \frac{r}{w} - \frac{\lambda}{1-\lambda} \left(\frac{s-r}{w} \right)$$

where MP_K is the marginal product of capital and MP_L is the marginal product of labour. λ is the Lagrangian multiplier. Assuming $s > r$, we have $\frac{MP_K}{MP_L} < \frac{r}{w}$, where $\frac{r}{w}$ is the cost-minimizing ratio. Therefore, under ROR regulation, firms produce an inefficient level of output and substitute capital for labour.

2.2 Price Cap Regulation

Another regulatory approach is price cap regulation. This method is used in many industries and is well-suited for the telecom industry as well. As mentioned in the introduction, telecommunication is a natural monopoly. Even with entry liberalization, it would become an oligopoly at best. Although large firms can improve investment to gain more profits by sacrificing efficiency under ROR regulation, there are still some small firms that will not follow this policy. Regulators don't want to see the large firms' inefficient over-investment behaviour. Thus, they introduce an average price ceiling to benefit cost saving firms. Under this approach, firms have the flexibility to choose the price structure. Unlike ROR regulation, regulators set a maximum allowed price of a specific product, taking into account factors that are beyond firms' control (Laffont & Tirole, 2000). In the UK, this approach is called RPI-X, where RPI is the Retail Price Index, and X is the rate of technological progress. This regulatory approach provides both flexibility and cost saving incentive to firms. For instance, if Bell Canada meets a market failure in wired local call service in Toronto, they could lower the local call price and retrieve the loss back from other services by raising prices, e.g. internet and wired long distance calls. However, the strategy of adjusting the internal price bundle will work only for a short period since competitors will react. Bell may meet the same problem again. Henceforth, a better strategy for Bell is to innovate and increase efficiency. This strategy could be more profitable, as technological progress is difficult to catch up in the short term. Thus, price cap regulation encourages inefficient firms to become more efficient via technological innovation, while limiting market power.

Compared to ROR regulation, price cap regulation requires less information for the policy-makers when designing the regulation. Price cap regulation only needs to define an average price

level and the estimated weights of different goods and services in the market (Boyer, 1997). The variable X is usually adjusted by the impact of inflation and technological progress within a certain period. However, it has its own shortages as well. Price cap regulation provides regulators substantial discretion and causes regulatory capture. It could cause lobbying and even reforms of the designed price cap (Laffont & Tirole, 2000). Another disadvantage caused by substantial discretion is the incumbent's predatory behaviour. Without violating the price cap, firms can raise the access cost, e.g. the rent of price of facilities to entrants (Boyer, 1997).

2.3 Access Pricing Regulation

The third regulatory method which has been applied frequently in the telecom industry is access pricing. When new entrants initially enter the local market, their resources may not be as abundant as incumbents, e.g. infrastructure, experienced staff, etc. New entrants can buy or rent incumbents' equipment or services at a discounted price. The access pricing rule is also called the Efficient Component Pricing Rule (ECPR), parity pricing principle or Baumol-Willig rule. Under this approach, new entrants pay the access fee that covers the opportunity cost of forgone sales for the incumbent. If the new entrants aim to be profitable, they need to be more efficient than incumbents. Besides, incumbents have some limited power to control new entrants, which lowers the threat from them. Access pricing regulation suppresses incumbents' hostile attitude to new entrants and encourages competition (Laffont & Tirole, 2000).

The Canadian telecom industry uses access pricing regulation. For instance, after the acquisition took place in 2009, 50% stake in Virgin Mobile Canada belongs to Bell Mobility. As Bell states on its official website, "...both Virgin Mobile Canada and Bell Mobility will realize enhanced operational efficiencies from shared network infrastructure, handset acquisition and common

distribution in high-traffic retail locations such as The Source.” (BCE, 2009) If Virgin Mobile enters the market independently, it is difficult to survive under Canada’s highly developed telecom market. VM doesn’t have an extensive infrastructure and resources compared with other service providers: not to mention the long time when Bell has dominated Canada’s telecommunication market. Hence, the right strategy for new entrants is to cooperate with the incumbents. With this cooperation, new entrants do not directly invade the market and snatch the market share from the incumbents. Instead, by building up partnership, incumbents and new entrants can benefit each other. As George Cope, President and CEO of Bell and BCE commented on the acquisition, “This initiative will allow Bell Mobility to be uniquely flexible in the competitive wireless marketplace, maximizing network, handset, distribution and global roaming efficiencies, and enhancing the growth of the No. 1 youth brand in Canadian wireless.” (BCE, 2009) The cooperation caused by access pricing regulation can lead to a win-win situation and also eliminate the incentive for the incumbents to deter competitive entry.

The limitation of this method is the measurement errors of the costs of access services. In some cases the information that incumbents provide is limited, which increases the difficulty in deciding the access fees. Regulators tend to utilize this regulatory method whenever they need to liberalize the market towards a relatively balanced competitive environment (OECD, 2004). If regulators distrust the accounting information of incumbents and set the access fees too low, new entrants would take this advantage and shirk from regulators’ expectation, i.e. innovation and productivity.

3. Problems specific to the Telecom Industry

Some issues and problems are recurrently being studied in telecommunication industries across countries. Here, we point to some of these issues.

3.1 Slow Diffusion of the Third Generation Technology

Bohlin, Gruber and Koutroumpis (2009) find that the number of third generation (3G) mobile telecommunication subscribers does not grow as rapidly as the first and second generation ones globally. The third generation is highly advanced in technological aspects, i.e. performs greatly in data transmission, whereas the first and second generations only focused on voice transmission. Subscribers have to pay higher service fees and own a new mobile device compatible with 3G service before enjoying the fast data transmission. However, subscribers are split into two distinct groups with different needs, which are data service favourite and voice service favourite. People who only needed voice transmission will remain in the second generation market and are less willing to transfer to 3G subscribers. The huge substitution effect makes 3G services less attractive.

Similar findings appear in Gruber (2007). This paper mainly focuses on the evolution of 3G market structure. He pointed out that there is an overbidding of 3G license fees through auctions in Europe. "...This [phenomenon] suggests that the introduction of 3G mobile services was driven mainly by regulatory and industrial policy objectives on the supply side rather than pulled by demand." (Gruber, 2007:36) Regulators may overestimate the quantity of 3G services demanded by the market. Some firms even did not utilize the license after having paid the high licenses fees. Figure 1 depicts the slow diffusion of 3G technology.

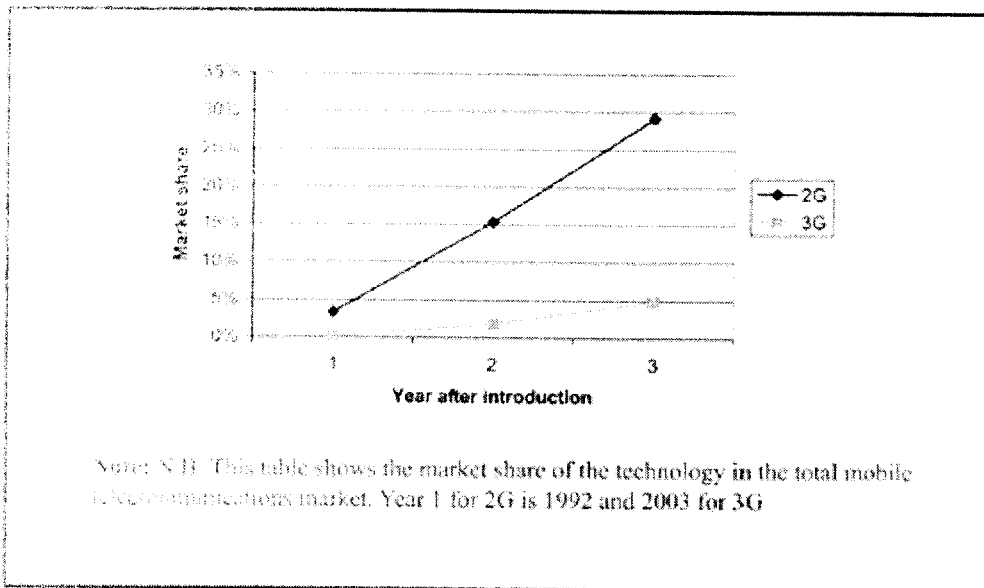


Figure 1. Market shares in the total mobile telecommunications market in Western Europe
Source: Gruber (2007)

One possible reason of the slow diffusion of 3G service is the unfamiliarity of new technology to consumers. People need time to adapt to new customs, especially in daily behaviour such as mobile communication. With new data transmission technology, people can execute more functions with a mobile device compared with the first and second generation technologies. For instance, checking/writing email, high-speed internet browsing, visual phone call, etc., these cannot be done with second generation technology. Therefore, as a society becomes more modern, the demand for third generation services should increase.

A report from Industry Canada (2004) depicts that there is an increasing trend in the number of wireless subscribers by each company from 1995 to 2003 (Figure 2). As the number of smart phone users in the market increases, more people will tend to subscribe to mobile internet access plans, though it is not yet as popular as other traditional telecom services such as local/long distance calls.

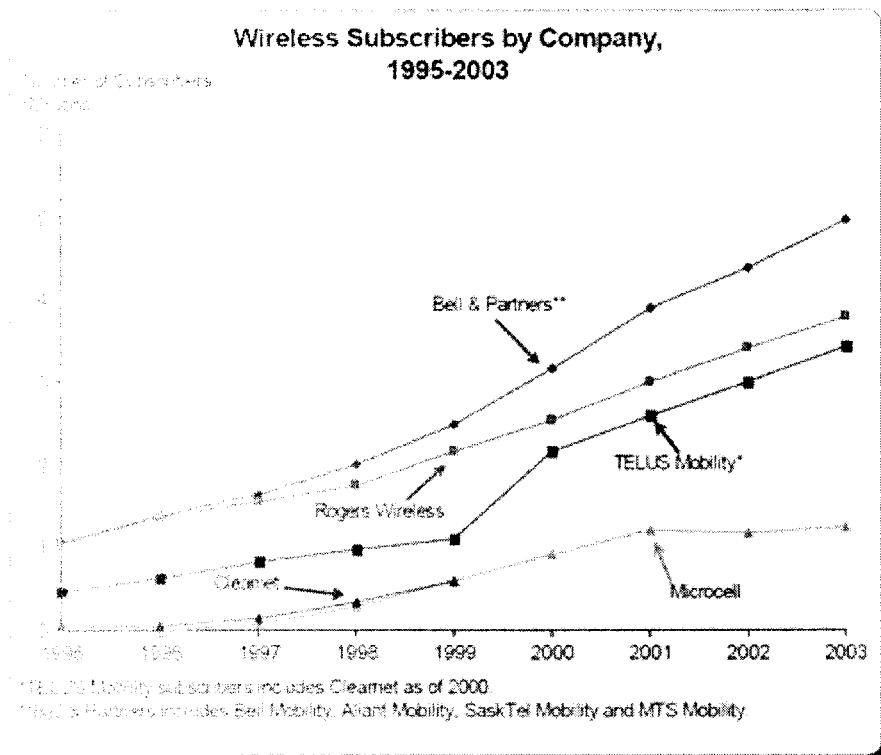


Figure 2. Wireless subscribers by different companies in Canada, 1995-2003
 Source: Industry Canada (2004)

3.2 The Future of Regulation for 3G Technology

Noam (2010) predicted that the regulation designed for the second generation (2G) era will not be well-suited in the 3G era. This opinion is based on four reasons: “instability of the sector, growing investment requirements, changing economies of scale and emerging presence of media in the telecommunications industry” (Noam, 2010:5). Noam defined the regulation designed for the 3G era as Regulation 3.0.

The first reason “instability” is caused by the high fixed costs and low marginal costs. It is costly to produce technological goods initially since expensive infrastructure is necessary to support telecom services. However, reproduction and diffusion are relatively cheap. This easily leads to oversupply since firms want to cover the high fixed costs by supplying more. In the 3G era, the ratio of fixed-to-variable cost is even higher (Noam, 2010). Therefore, regulators have to

emphasize stability in Regulation 3.0 and prevent fluctuation in prices. The second challenge investment “requirements” means the hardware of new technology facilities are costly. Incumbents with substantial existing debt make investors less willing to finance them. The third problem of Regulation 3.0 is the “changing economies of scale”. Although in the 2G era, policies encouraged new entrants to compete with incumbents, it is difficult for new telecom entrants to do so. Incumbents have high economies of scale before new players enter and they own a high developed infrastructure-based platform. Incumbents also have greater political influences on regulators than newcomers. With the 3G technology, the market structure will be reformed. Incumbents and new entrants can have limited cooperation via encouraging regulation, e.g. access pricing. The last issue Noam is concerned about is the increasing liberalization of political content on internet media. In general, governments used to have great influence on traditional media content for societal and political reasons. However, as the increasing transmission speed by the third generation technology is adopted by more households, the influence of political control declines. Regulators are finding it more difficult to maintain their control on the media since consumers can view information anywhere on the internet. Therefore, Noam suggests some main focuses when establishing new regulations.

Different regions have different equipment basis as well as different competitive environments. Some rural towns may even stay at the first telecom technological basis. Regulators should not apply a universal rule to any place before the entire country adapts 3G technology completely. Policies should be conducted by experienced officers when implementing particular policies. Sometimes a good policy should be flexible with respect to the customized need of a market, e.g. public-private partnership. Also, temporary regulations could be designed for unstable situations. If the market demand is lower than expected, regulators can offer a short-term tax cut. In order to

maintain the same level of attractiveness for investors, policies can be adjusted to fluctuation of the investment cycle. Although the 3G technology is a technological upgrade to the 2G one, regulations have to evolve as the infrastructure and service are not identical anymore. Regulators should guide incumbents and new entrants appropriately when new rules and new market condition arise (Noam, 2010).

3.3 An Individual-Level Targeted Model

Cha et al. (2008) analyzed price reduction effects in mobile telecommunications traffic in Korea. Although traditional mobile telecommunication services are charged depending on price elasticities of demand, 3G service providers do not have enough data to estimate the elasticities of 3G technology services. Most research in telecommunication studied aggregate demand data and few of them could work on individual-level data. “Telecommunications charges generally differ by service provider, service, and tariff. A price reduction for any particular service can affect individual usage for every other service available in the market.” (Cha et al., 2008:469). This could explain why the characteristics of individual-level demand are so difficult to capture. Based on such reasons, Cha et al. developed an individual-level usage model to examine the strategies for price reduction that vary among different situations.

They develop a microeconomic model to examine how an individual’s behavior will change when there is a price reduction for advanced services. The model differentiates individuals by age, expecting the usage of telecommunication services to vary among different age groups. For instance, the youth group is more likely to use text messaging than the elders, as youth like to socialize more. After simulating the model with several procedures, the most appropriate age groups that should receive price reductions are, in descending order: below 10, 45 to 49, 50 to 54.

55 to 59 and above 60, conditional on minimizing revenue loss from tariff or regulations. Their market segmentation model is appropriate for age-stratified markets as the main scope is on the individual level.

This type of model could be used by both regulators and firms as neither of them are familiar with the price elasticities of demand of 3G technology. Regulators are immersed in a foggy situation under the rapid development of telecommunication technology. There are neither sufficient data nor historical experience for regulators to follow. This idea is similar to Noam's (2010) finding: experience from 2G era regulation can't sufficiently work in 3G era. Therefore, a price reduction in advanced service, i.e. mobile internet, may help service providers diffuse the new technology widely. Regulators want to encourage the diffusion of advanced technologies, e.g. high transmission speed. However, some groups of people are price insensitive. With the model Cha et al. established, both regulators and carriers now have a better prediction on consumers' reaction.

3.4 Bertrand Equilibrium for the High Fixed Cost Case

The telecommunication industry performed as a natural monopoly since it used to be regulated by the government or operated by monopolies without expansion of competition in the past. Yet, the dominant view now is that competition should be imposed to achieve dynamic efficiency (Melody, 1997; Song, 2009). When the telecom industry develops towards market liberalization, two considerable problems have to be overcome. The first is to enhance competition, and the second is to sustain it. If new entrants enter without sufficient government support, due to the high fixed cost (which is discussed by Noam, 2010, and in section 3.2 as well) and lack of market share at the time of entry, new firms may withdraw from competition and the telecom

industry may become a monopoly again. On the other hand, regulators should keep their hands off the market as soon as a level of efficient competition is reached (Smith & Wellenius, 1999).

Song (2009) proposed a model to solve such a dilemma, involving a revised concept of Bertrand equilibrium. The feature of the equilibrium in his model satisfies two goals: enhancing price competition and suppressing predatory pricing. He took the telecommunication industry in Korea as an experimental target. The Korean regulators set asymmetric regulations to cope with the existing asymmetric market power between incumbents and new entrants. For instance, when the incumbent SK Telecom asks for changes in the tariff, it needs to gain permission from the regulators first. But the late entrants, KT Freetel and LG Telecom can change the tariff before reporting. The interconnection discounted fees between two new entrants follow the same regulation as well. Hence, the government maintains the incumbents' profit at a sufficient level and encourages competition by implementing asymmetric regulatory approaches.

Although Song's model provides a feasible way to formulate regulations, the model is simplified by considering the price factor only. Nevertheless, the model could still be a benchmark for regulation and the equilibrium can be reached by proper regulations when market conditions are stable. The model is successful for competition sustainability in a hypothetical simplified environment. But competition enhancement is controversial since the history of the Korean telecom industry doesn't support the model.

There are several restrictions in Song's model. The unique equilibrium can be met only when the fixed cost is sufficiently high. This assumption accurately depicted the early stage of the Korean telecom industry, i.e. the fixed line service era. However, with access pricing regulation, the outcome may vary. Since new entrants acquire infrastructure from incumbents, the fixed costs

are lower for them. Another limitation of the model is the lack of consumer surplus examination. In other words, we can't see the response of the market when demand changes. Therefore, this model doesn't capture consumer benefits.

3.5 Internationalization of the Telecommunication Industry

An interesting literature review conducted by Jakopin (2008) depicts telecommunication industry development from a statistical point of view. The author analyzed the literature with respect to different areas of telecommunications and tried to find out which topic has been over/under studied. This review covers 356 publications addressing the internationalization of telecommunications as of the end of 2008.

In the quantitative review section, the author classifies all the publications by research focus, the predominant telecommunication segment and language of publication. The detailed distribution of each classification is presented in Table 1 and 2.

From Table 1 we can conclude that descriptive research composes the majority of scholarly literature in telecommunication industry research focus, whereas the other two aspects, theoretical and empirical parts are less studied. Traditional wire line service has been studied a lot since it contains the most mature first generation technology and has been regulated for the longest time.

Type of Contribution	Total	Research Focus			Main Segment		Language		
		Descriptive/Cases	Theoretical	Empirical/Expl.	Wire-line	Mobile	Other/General	German	English
Journal article	225	138	48	56	149	20	56	18	207
Article in edited volume ^e	39	34	6	2	31	0	8	9	30
Book	40	23	21	9	30	3	8	7	33
Book section ^f	14	10	4	3	11	0	3	5	9
Edited volume to conference	5	5	0	1	5	0	0	0	5
White paper	33	23	4	9	17	9	7	4	29
Sum	356	233	83	80	243	32	82	43	313
Percentage of Total		65%	23%	22%	68%	9%	23%	12%	88%

Table 1. Inventory of publications addressing telecommunication internationalization issues
Source: Jakopin (2008)

Research Themes & Topics	Total	Research Focus			Main Segment		
		Descriptive/Cases	Theoretical	Empirical/Expl.	Wire-line	Mobile	Other/General
Antecedents of international telecommunications policy	58	14	30	21	54	0	4
Documentation of paradigm shifts in the international telecommunications system	103	80	20	12	89	0	14
Policy of national regulation authorities	39	34	6	4	28	0	11
Incumbents' reactions to liberalisation and privatisation	55	41	10	10	37	2	16
International strategic alliances of incumbents	27	23	3	5	19	1	7

Table 2. Main research themes covered by publications on telecommunication internationalization
Source: Jakopin (2008)

Table 2 provides the statistical results regarding the internationalization topics in publications. In most cases, researchers focus on domestic market events more than on international ones. The

topic of telecommunication internationalization has never been emphasized as other fields of study have. The interpretation that the author provides is due to historical reasons. During the 1980s and early 1990s, the telecom industry is controlled by state-owned enterprises in most countries and regions, especially Europe. Therefore, local services are still controlled by dominant firms during that period, whereas internationalization only received little attention from regulators.

In the last part, the author predicts that internationalization of telecommunication will be emphasized more in the future. He points out three important aspects for regulators and future researchers, which are resources, conduct and performance. Some management-related literatures were included in the 356 contributions. Although they may be helpful, “some segments of the ... [telecommunication internalization] and operator resource positions, conduct and strategic behaviour, as well as firm performance still provide significant opportunities for research endeavours” (Jakopin, 2008:540).

3.6 Summary

In the literature review section, the author went through several specific issues that were studied by other scholars. The first topic is the slow diffusion of 3G technology in Europe. Gruber (2007) pointed out that regulators didn't utilize the expensive 3G license fees efficiently. The same problem occurred in Canada and China (see section 4.1), as mobile internet service subscribers are fewer than regulators expected. It seems like neither sufficient regulations nor widespread technological adoption is achieved in 3G era. To guide the direction of the regulation in 3G era, Noam (2010) reviewed the past regulations along with all three stages of telecom industry and proposed future direction. As technology is progressing, regulation should be adjusted. Faster

transmission speed brought by 3G technology leads regulators to focus more on monitoring and filtering information in telecommunication. Since neither regulators nor firms are familiar with the 3G market due to insufficient studies of this field, Cha et al. (2008) constructed an empirical model to examine the elasticity of this new service. The model studied the effect of price reduction on individual age groups instead of aggregate demand, conditional on minimizing revenue loss. The result indicated that by decreasing the price of 3G service, young people will be more attracted than older groups. This conclusion can guide those countries with slow diffusion of 3G services. Deploying 3G services in telecom market is only one side of the story for regulators. Another side is to keep competition on a sufficient level. Song (2009) prepared a Bertrand Equilibrium model for regulators. The basic concept is to apply asymmetric regulations to incumbents and new entrants. By taking advantages of regulations, new entrants could grow fast and gain higher revenue whereas the development of incumbents in 3G era is suppressed. By taking an overview of the scholarly literature in telecom market, Jacopin (2008) found that descriptive researches are much more extensive than the theoretical and empirical ones. Besides, traditional fixed-line services have higher attention than mobile services. Thus, scholars need to spend more time studying mobile service in order to help regulators comprehend the current technology.

4. Case Study: Four Large Countries

In the following cases, we will see how regulation evolved from the early eras till recent times and how it performed in different countries and regions. We analyze China, UK and Germany in regard to their telecom industry regulations. However, the last country, Canada will be studied in a distinct perspective.

4.1 China

The first perspective we take is on the biggest nation in Asia, China, which contains the largest potential and market. Xia (2011) reviews the development of Chinese regulation in telecommunication from 1994 to 2008, which included four rounds of industry restructuring.

4.1.1 A Glance of 2008 Telecom Industry Reconsolidation

The latest and drastic restructuring in China took place in 2008. There are two purposes behind this industry restructuring. First is to deploy 3G technology and service broadly in the telecom market, and second is to reform a balanced competitive market. In this reconsolidation, China Netcom was merged into China Unicom and the former Unicom's network was merged into China Telecom.¹ Industry players were reduced from six to three and all the carriers now became full-service providers. The carriers remaining after restructuring were China Mobile, China Unicom and China Telecom. The new regulatory Ministry of Industry and Information Technology (MIIT)² was also established in 2008 (State Council, 2008) in order to cooperate with this reconsolidation. After receiving 3G licenses at the beginning of 2009, those three carriers were eligible to provide fixed-line, mobile phone and mobile internet services. However, those three carriers gained different advantages from the 2008 reconsolidation. China Unicom and China Telecom were greatly promoted in fixed line services, whereas the incumbent China Mobile acquired new mobile internet services. Although the third-generation (3G) mobile service contains the most recent and popularly adapted technology for carriers in most countries, China adapted and implemented this technology later compared with most Western countries. Those

¹ China Netcom was one of the six carriers before the 2008 reconsolidation and became part of China Unicom after the reform. The CDMA network originally belonged to China Unicom and it has been transferred to China Telecom after the 2008 industry restructuring.

² The former regulatory department of MIIT before 2008 restructuring was the Ministry of Information Industry (MII).

three carriers could only provide limited data services in the early 3G era since the 3G equipment didn't deploy broadly. The early 3G era in China was referred to as 2.5G. The domestic telecom infrastructure was under-developed in handset technology and network speed. Though the mobile internet service was provided, consumers couldn't completely utilize and enjoy it. Xia describes this situation of China as facing "both opportunities and challenges in the era of 3G and beyond." (Xia, 2011:51). Inevitably, China will need a substantial period of time for 3G (or beyond) services and parallel equipment deployment to become mature.

4.1.2 Evaluations and Analyses of 2008 Reconsolidation

Although the top legislature of China, i.e. the Standing Committee of the National People's Congress, established a Chinese Anti-Monopoly Law in August 2007 (it took effect in August 2008) (Li, 2011) to help liberalizing the telecom market, the 2008 reconsolidation hasn't achieved a fairly competitive environment, reflected in the relative market positions and individual market shares (see Table 3). China Mobile is the strongest carrier before and after the reconsolidation. Even though it holds less market share in landline and Internet, China Mobile is still the most dominant carrier compared with the other two. In comparison, the advantages of China Telecom and China Unicom are the relatively large base of landline users. These landline users may convert to 3G mobile users in the future and continue using current carriers' services.

Was the first goal of the reconsolidation, i.e. deployment of 3G service successfully achieved? By viewing the global statistics, the 3G market in China is still in the cradle. The global average of 3G service users among total mobile users is 14%, while in China it is only 3% (Xia, 2011). In fact, the first-mover nations of 3G technology in Europe had also experienced this similar slow adoption issue and only reached 5% penetration after a two to four years period (Fuentelsaz et al.,

al., 2008). Therefore, the diffusion of 3G service in China will probably take years in order to catch up with the global average.

			China Mobile	China Telecom	China Unicom
Market share (Number of users, in millions)	Mobile	2.5G	450.0	27.9	132.9
		3G ^a	10.5	7.2	7.6
	Landline users		Very marginal	210.0	105.0
Profitability (net profit, in RMB billions)	Internet users		Very marginal	43.5	25.4
			115.2	14.4	9.6

^a Data as of June, 2010.

Table 3. Relative Market Positions of Three Carriers in Mainland China

Source: Xia (2011)

As mentioned previously, the second goal of the Chinese government is to establish a relatively balanced telecom market structure. The strategy of Chinese regulators is to promote the weak players (China Unicom and China Telecom) and tighten the strong player (China Mobile). However, a balanced market doesn't mean competition among identical firms. The advantages of each carrier focus on different aspects (Yeo, 2009). We noted that after the reform, all three carriers became full-service providers. The new service of China Mobile, i.e. fixed-line service, didn't perform well as its market share is tremendously small compared with the other two (see Table 3). Nevertheless, the performance of China Mobile's 2.5G mobile service is remarkable. From Table 3, we can see that the 2.5G market share of China Mobile is approximately 15 times that of China Telecom and around 3 times that of China Unicom. The factors behind the successfulness of China Mobile in 2.5G market are mobile industry experience, network resources and high profitability, coming from the previous telecom era. These factors consolidate China Mobile as a strong and dominant incumbent. Yet, the 3G market share of China Mobile isn't as dominant as in the 2.5G market, due to the shortage in TD-SCDMA technology and network speed. Disadvantaged mobile handset technology would constrain the development of

the 3G mobile network service (Onoa & Tang, 2010). In order to compete with the dominant incumbent China Mobile, China Unicom introduced the most mature technology WCDMA network. China Telecom, the conventional fixed-line service provider with no mobile industry experience before, gained the American technology CDMA2000 network, which is also more advanced than TD-SCDMA (Yeo, 2009). Therefore, all three carriers have to make efforts in different directions depending on their own shortages.

We now examine the differences among these three carriers' networks. Similar to the market share distribution, the 3G technologies used by the three carriers also have hierarchical positioning. China Unicom's network, WCDMA, is the most mature technology and broadly adapted in more than 100 countries, dominating 77% of the global 3G market. China Telecom's network, CDMA2000, owns the remaining 23%, which is the second dominant 3G network (Xia, 2011). China Mobile's network, TD-SCDMA, deployed primarily in mainland China, seems to be the weakest, characterized by slower speed, lack of international experiments and an immature handset terminal technology (Li, 2011; Xia, 2011). These disadvantages on the domestic technology front act as an obstacle for China Mobile's 3G market penetrations. Table 3 illustrates that the market shares of 3G mobile service among the three carriers are close. As the deployment of 3G services widens, users of China Unicom and China Telecom will increase due to better transmission speed and advanced network. The Chinese government, fully aware of this technological issue, expected widely deploying 3G services and improving the domestic 3G technology in the meantime. Officials made special efforts on advertising. For instance, by issuing a number of regulatory notices and documents to promote TD-SCDMA, the government tried to encourage consumers to support the domestic network (MIIT, 2009). Meanwhile, China Mobile has also developed the enhanced version of TD-SCDMA, calling it TD-HSPA. The

purpose of TD-HSPA is to provide better 3G service and compete with the advanced technologies from its competitors; TD-HSPA is currently in the deployment and facility upgrade stage. In other words, TD-SCDMA is just a temporary network for China Mobile, due to its technological disadvantage. The other two carriers have witnessed China Mobile's technological progress and have developed their respective enhanced networks as well.³ This campaign of technological competition was drastic and would accelerate the growth of the 3G market. The competition also illustrates that technological progress indeed plays a crucial role in 3G deployment in China.

4.1.3 Challenges of 3G Deployment in China

There are four issues that need to be solved before China enters a successful 3G deployment stage. The first and biggest challenge that both regulators and firms need to confront is technical adoption. As mentioned in section 3.1, Gruber (2007) discussed the similar problem that took place in Europe. Regulators and firms may have an inaccurate prediction on the market demand of 3G services. As China is still a developing country, the maturity of the 3G market is mainly dependent on the consumers' preferences, i.e. their readiness, innovativeness and budget. Several factors contribute to this challenge, such as substantial switching costs, substitution effects from the current 2.5G service, limited advertising versus large population and incompatible features via 3G service (Xia, 2011). Xia (2011) classifies the first three issues as demand-pull issues and the last one as a technological-push issue. As these two sorts of problems were not present in the previous eras, former experience is not sufficient to address these problems. Moreover, by applying Rogers' diffusion of innovations theory (1962), consumers are categorized in five groups: innovators, early adopters, early majority, late majority and laggards. Late majority and

³ For more details on the technological competition among these three carriers see Xia (2011).

laggards consist of a large proportion of China's mobile users. Due to their low income, these two groups are highly sensitive to costs. As a result, the 3G service in China hasn't reached market maturity. Carriers have to innovate in the popularization of 3G service and marketing strategies.

The second challenge is the firm-level reconsolidation. We noticed that the number of telecom firms declined from six to three after the 2008 reconsolidation, which included lots of administrative reforms. A successful reconstruction should ensure that "merged parties are integrated physically, organizationally, and culturally" (Xia, 2011:58). Integrating requires coordination and cooperation between departments and staff. A merged organization can result in resource misallocation and distortions due to inappropriate management (March & Simon, 1958). As the deployment of 3G technology involves a high level of technological innovativeness, integration among departments will require a long period of time to reach an efficient level and effective corporate culture.

The third challenge is the impending convergence with cable network, advocated by the Chinese government. In January 2010 the State Council of China attempted to merge the service of telecommunications, internet and cable networks, calling for "tri-network convergence" (State Council, 2010a) and implemented this policy at twelve trial cities six months later (State Council, 2010b). Before this action, telecommunication and the Internet were managed by MIIT and cable network was monitored by the State Administration of Radio, Film, and Television (SARFT). However, SARFT is directly supervised by the Communist Party of China's ideological regulatory sector, CPC Propaganda Department. Regulatory convergence will be unexpectedly complicated due to the involvement of the Propaganda Department, which ought to monitor and induce all the public media information. The convergence can also cause regulatory

confusion and jurisdiction conflict on inappropriate contents on the internet, e.g. pornographic contents, militarily sensitive information, bureaucratic issues, etc. As seen in section 3.2, Noam (2010) also mentioned this potential issue. The 3G technology, i.e. mobile internet service makes it more difficult for governments to control media contents and decreases the public political power. Public media contents used to be supervised by SARFT. Yet, according to the State Council (2010a), MIIT also has the right to intervene in the market. Unsuccessful cooperation between two regulatory segments would decrease efficiency. The rise of ambiguity between different regulatory segments should be seriously considered by the government in the future (Yeo, 2009).

The last challenge is the institutional and regulatory uncertainty. Before the 2008 restructuring, three structural reforms took place in 1994, 1998 and 2002 respectively. All of them generated unexpected effects afterwards due to incomplete execution. For instance, during the third reconsolidation that took place in 2002, China Telecom was split into North and South segments.⁴ The purpose of this reform was to set up a competitive environment in the fixed-line market. However, the two departments reached an agreement for not entering each other's market after negotiation (Yeo, 2009). The result turned to be a regional monopolies situation. It's too soon to know whether the fourth reform will be successful, since reforms are always subject to institutional and regulatory uncertainty. Governance cannot completely eliminate the potential risk of uncertainty with a single law or document, such as Chinese Anti-Monopoly Law. To achieve market sustainability and compatibility in telecommunication, regulatory missions need to be addressed by a step-by-step adjustment (Xia & Lu, 2008). Therefore, a successful level-playing-field should be achieved by multi-sectors negotiation and tactics in the long-run.

⁴ Details on previous restructurings are found in Table 4 of Xia (2011).

4.1.4 Overview and Indications of 2008 Reconsolidation

It has been shown above that the current restructuring is filled with regulatory uncertainty. The Chinese government needs to find solutions to the four challenges previously mentioned. In the market segment, resource distribution should be as even as possible for each carrier in the telecom market (March & Simon, 1958). For merged parties, a common agreement of missions on both sides is necessary in order to be compatible with regulatory efficacy. In the technology segment, since the technological gap between domestic TD-SCDMA and foreign network system persists, a “level-playing-field may not be realistically built in 3G era in China” (Xia, 2011:60). Yet, in the long-run, say, in 4G era, the technological gap could become marginal and the substitution effect from the current 2.5G would be smaller, as consumers’ adoption and readiness are progressing. In addition, China has been developing a domestic 4G standard, TD-LTE Advanced (People.com.cn, 2008)⁵. The Chinese government has chosen TD-SCDMA, which is the relatively weak technological domestic network, as a transitional test-field for evolution towards the next-generation telecommunication network (Phoenix Chinese Channel, 2010)⁶. All this information indicates that the Chinese government is confident about its domestic network standard, even in the next generation era (Lian, 2009). Moreover, specialized regulatory governance should be involved in the telecom industry because of its highly technological nature. The authorities should communicate on an integrative perspective in order to maintain a coordinated and effective regulation.

In sum, the Chinese 3G market and regulatory policies are still young and immature. During this transitional period, the competition between the incumbent and new entrants did not perform

⁵ People.com.cn. (2008). *Guohua Xi: The timing of 3G is mature and the development of 4G is underway*. (Xi Guohua: 3G shiji chengshu 4G yijing qidong) <http://invest.people.com.cn/GB/7078670.html>.

⁶ Phoenix Chinese Channel. (2010). Li Yizhong: 3G license effectively pressure China Mobile who host TD (Li yizhong: 3G paizhao dengyu gei zhongyidong chengdan TD shiya) <http://hb.qq.com/a/20100317/004223.htm>.

exactly as regulators expected. Strictly speaking, China may not fully enter the 3G era, as neither adequate technological-push nor demand-pull exists (Xia, 2011). Regulation should be carefully constituted when regulators try to intervene in a high-tech market such as telecommunication field. The distinctive cultural and institutional factors in the Chinese telecom industry can be an example worth studying and observing, especially for research on other similar economies which adopted 3G technology later than developed countries.

4.2 UK and Germany

In this section we will study the political cycle of telecommunication regulation of the UK and Germany in a comparative perspective. We will also investigate the relationship between the two countries' regulators and the following: EU's regulatory purpose, competing regulatory authorities, regulatees and consumers.⁷

4.2.1 Deviation on Regulations between EU and NRAs

A controversial phenomenon took place in the 1990s in European telecommunication regarding the member countries of EU. Several scholars claimed that according to their research, different national regulatory authorities (NRAs) are following each country's regulation (Thatcher, 2002; Coen et al., 2002; Levi-Faur, 2002). In other words, there is no universal regulation for member states to follow. As a result, deviation on regulations between EU and NRAs occurred.

A rough summary of the EU regulatory life cycle follows. The liberalization of the telecommunication market brought important changes, particularly to monopoly incumbents. The coercive pressure of EU licensing directive (EC/1997/13 final) liberated the markets of member states and separated regulatory control and ownership (Coen & Thatcher, 2000). Under

⁷ The intimate regulatory relationship was further introduced and studied by Hancher & Moran (1989).

this action, the EU expected to prevent collaboration between regulators and firms as well as the monopoly market power abuse. Yet, market liberalization didn't progress as what the EU directive stated. Since NRAs insisted on sticking to their institutional and administrative cultures, the diffusion of new regulations moved with different paces in different countries.

4.2.2 The Internal Evolutionary Processes of Regulations

Now let's take a step back and see how telecom regulations have developed and innovated domestically. Like in several other countries, three phases of telecommunication regulation are observed in Europe. In the initial stage, i.e. the fixed-line service era, the market power of monopoly was easily abused since asymmetric information existed between regulators and monopolists. Due to NRAs' insufficient supervision and information, monopolists gained larger profits than regulators expected (Parker, 2004). The activities and costs of regulators' supervision gradually increased. In the second stage, i.e. the mobile-phone service era, new entrants were introduced into the market. Regulators in each country had to spend higher costs and human resources to regulate a new competitive market. For instance, retail markets regulation was the main concern for regulators in the first era. But in the second era, after the level of competition increased, regulators had to suppress collaboration among firms. Moreover, as a country's regime developed, overlapping competencies and institutional conflicts between regulators and competition authorities emerged, which is similar to the third challenge of the Chinese 2008 reform. In the third phase, i.e. the mobile-internet era, under a mature and established competition environment, the influence of regulation may weaken. There are also compromises between the regulators and firms as the regulatory authority's original enthusiasm disappears (Bernstein, 1955). But that doesn't mean regulatory authorities should give up their

power of monitoring the market. The goal of establishing a balanced competitive market could be achieved by improving existing regulations.

Regulators altered and adjusted the existing regulations based on several factors. Changes in regulation are not influenced by market forces only, but also by business reaction and administrative traditions. Initially, reactive lobbying and limitative information providing are commonly used by consumers in the monopoly stage. In the recent era, sophisticated consumers and rational political authorities would put pressure in order to increase competition (Coen & Willman, 1998). Firms and consumers reached an agreement more easily than before via regulators' intervention.

Although firms provided limited information to regulators in the monopoly stage, it is possible for these two sectors to cooperate with each other. In the second-generation mobile service era, NRAs modified their regulating strategy in response to the increasing number of both mobile service subscribers and providers. Under a higher level of competition in this stage, industry information was booming for regulators whereas firms competed tensely with each other (Coen, 2005). Regulators and firms have noticed the importance of exchanging information and trust building. As NRAs accessed more information through cooperation, they may use their discretion to collaborate with firms, e.g. reduce the fine that a firm which violates the law should pay. Firms are likely to be regulated and monitored by NRAs, as this cooperation provides flexibility to them. This interaction helps to build up a tight relationship between NRAs and regulatees. Thus, unlike the first stage, NRAs gathered more information on the market, provided by cooperating firms. In addition, the "bonding relation" between firms and NRAs has a positive influence on NRAs' independence, which helps them to deviate from EU's political pressure. Yet, regulators must be alert to potential regulatory capture, meaning that they shouldn't be led

by firms (Willman et al., 2003). As firms become more cooperative with authorities, NRAs can assert and implement their legislation in a better platform.

4.2.3 The External Evolutionary Processes of Regulations

The relationship between NRAs and EU's authorities has changed from intimacy to incompatibility. In monopoly era, firms utilized the advantage of asymmetric information and regulatory deficiency against NRAs (Coen et al., 2002). NRAs could not fully implement their regulatory powers individually and failed to influence market development (Hall et al., 2000). Therefore, political pressures and delegated powers from the EU helped NRAs to pursue their regulatory goal at this stage. However, when entering into the second era, cooperation between NRAs and firms has built up, as discussed in the last section. NRAs started to develop credibility and independence in their own countries, distancing themselves from EU's influence.

When regulation is depicted in a broader environment, *i.e.* Europe, as targets are several member states instead, the procedures of solving conflicts will be complex. Clashes between EU's authorities and national ones are more intense than between NRAs and firms. To maintain regulatory procedures at the national level and get rid of EU's control, competition regulation and courts are two common tools used by NRAs. When a case is decided at the European level, the national political principal is replaced by the EU's one. The European Court of Justice (ECJ) and Commission liberalization directives may also intervene to achieve universal service goals (Scott, 2000). In contrast, the EU has several approaches to constrain the NRAs, including control of budgets, director general nominations and licensing (Boellhoff, 2005). Especially, replacement of director generals "has acted to deter too much independent activity" (Coen, 2005:63).

On the other hand, politicians from EU and NRAs ought to renegotiate the terms of the delegation whenever they find it necessary. Two scenarios may cause the renegotiation. First, a government feels that the NRA considers its own standard prior to the EU's one. Second, the market structure has changed and needs intervention. The outcome in either case can result in drastic change to the NRA, such as a replacement of the director general, budget cuts or downgrading the powers of regulators (Coen, 2005).

By observing the controversial situation of the NRAs, the EU constructed a telecommunication regulatory regime (EBRD, 1990). The procedure works as follows: 1) firms initially present their demand to the NRAs regarding pricing and access problems; 2) business and regulators discuss with governments and/or ministers, who are authorized to call for the principles of universal services and regulatory appointment; 3) the three sectors—governments, NRAs and business lobby the European Commission, which makes the final call such as deciding internal market directives or competition issues. Although the European Commission has advocated liberalization and sought for a convergence of different standards for member states, it has not attempted to weaken the power of NRAs or even control them. As article 7 of ONP Directive 90/388/EC states: *“the granting of operating licences, the control of type approval and mandatory specifications, the allocation of frequencies and surveillance of usage conditions are carried out by a body independent of telecommunications organizations.”* Thus, the European Commission is comprehensive about not intervening in a country's regulatory institutions too much. Rather, it is important to let NRAs conduct and implement regulation. By approving this new telecom regulatory regime in 1990, the EC generated an independent legislature and expected to apply it across nations.

4.2.4 Experience from Britain

British Telecom (BT) is the biggest telecommunication service provider in Britain. In order to liberalize the market and make BT compete with other firms, the British government privatized it by the passing of the Telecommunications Act in 1984. In addition, price-cap regulation was introduced to encourage private firms (Newbery, 2000). As a result, 51 percent of the company's shares were sold to private investors (Coen, 2005). Several studies have argued that BT caused the slow movement of market liberalization. And the government tried to maximize its revenue returns on shares and provided a buffer time for BT to innovate and increase its market penetration (Baldwin & Caves, 1999; Parker, 2004). A specific NRA was founded after the passing of the 1984 Act, called the Office of Telecommunications (OFTEL). Different from traditional NRAs, OFTEL is an independent regulatory authority and the director is delegated by the EU.⁸ The duty of OFTEL is to supervise the government-issued licenses. With this independent regulator, credible commitment in the market is well established and policy consistency over time is guaranteed (Parker, 2004). With this credible, independent and responsible agency, private investors have more interest in entering the telecom market and competing with BT. In addition, political uncertainty is reduced, as well as political pressure (Majone, 2001).

The UK regulatory framework provided considerable discretion to other countries. Specifically, OFTEL can implement the competition action whenever it is deemed necessary. This discretion plays a crucial role in the regulator-regulatee relationship (Stelzer, 1996). Different director generals of OFTEL have distinct perspectives on the market and implement their powers in different ways. Yet, the flexibility of a director general's power creates uncertainty when clashes

⁸ See Li (2011) for the detailed definition of independent regulators.

with the EU occur. For example, OFTEL issued a procedural document in 2000, asserting to maintain its leading power to the concurrent competition power from the other regulatory authority, the Office of Fair Trading (OFT). “OFTEL was well aware of the dangers of the loss of regulatory primacy, and the likely consequences of a competition policy emphasis on the provision of universal services” (Coen, 2005:68). Since then, the regulatory process in Britain stagnated and was criticized by others. The European Commission claimed that: “*Britain had relegated itself from the premier league (of European telecom regulation) to the relegation zone of the second division.*”⁹ OFTEL, from a pioneer, became an EU institution follower. Therefore, the British regulatory process changed dramatically.

4.2.5 Experience from Germany

Privatization of the telecommunication industry in Germany has moved slower compared to the UK. The strong monopoly market power in Germany used to have connections with PTT¹⁰ and Unions and this delayed the deployment of regulation (Grande, 1994; Werle, 1999). The actual innovation in market liberalization took place in 1996 with the passing of the Post and Telecommunication Reform Act. Although a large number of new entrants are active nowadays, a majority of the stake of the incumbent, Deutsche Telecom AG (DT) is still held by the German government. In other words, the privatization of telecommunication in Germany isn't as successful as what the EU expected.

The German telecommunication act functioned similarly as the UK one. By pressuring the existing incumbent, public monopoly was eliminated. The new independent regulator of

⁹ Stated by Olli Rehn, who is a chief aide of an EU's commissioner: Erkki Liikanen. Source: *Blocked: Britain is falling behind in the Internet economy. Blame its telecoms regulator.* The Economist.

¹⁰ Postal Telephone and Telegraph, is a government agency in many countries worldwide responsible for postal mail, telegraph, and telephone services.

Germany, the Regulatory Authority for Telecommunications and Post (RegTP), was founded in 1998, two years after privatization. Its duty is to make the market obey the German Competition Law and monitor the profit of DT. Nevertheless, as in the UK and China, confusion and dissension between different regulatory sectors have unfolded. The Federal Cartel Office (FCO, *Bundeskartellamt* in German), a traditional NRA in Germany also has the obligation to monitor the telecom market by law. The efficacy of the telecommunication market was impaired by the parallel competencies between RegTP and FCO.

Compared with the UK, although both RegTP and OFTEL are independent regulators, the discretion and independence of RegTP is relatively weaker than for OFTEL. The German constitutional doctrines of ministerial obligation provide the right for the ministry to control NRAs (Gilardi, 2002). For instance, after the RegTP has taken decisions on licence fees, prescripts of universal services and price regulation, the Economy Minister can retract those decisions made by the NRA in regard to national economic deliberation. Boellhoff (2005) criticized that the German regulatory authorities are a barrier to market stabilization. Although the government partly owns the incumbent, it ought to follow the strategic responsibility and regulate the telecom industry. The RegTP is authorized to control the market and should have less intervention from the German government. Overall, the RegTP is nominally independent but is restricted in reality. The Economy Ministry should be responsible to act as an advisory institutional member only (Werle, 1999; Boellhoff, 2005).

4.2.6 The Evolution of the Business-Regulator Relationship

The business-regulator relationship can evolve along two paths (Coen, 2005). Like the transitional period from fixed-line era to mobile-phone era, regulators' asymmetric information issues would become marginal over time. Due to the potential cost of punishment, firms would

act more legally to avoid prosecution from NRAs. The first evolution of business-regulator relationship depicts as follow. Firms may operate along the edge of regulations, providing the minimum information required by authorities. As a result, regulators achieve the delegated purpose set by politicians, without further improvement of regulatory competency. Hence, the business-regulator relationship stays at minimum level. This scenario unfortunately took place in the UK in the early 1990s. The alternative relationship is the opposite: an intimate relationship between regulators and business will rise over time. As they acknowledge the importance of trust, information exchange and deliberations can be processed (Stelzer, 1996; Willman et al., 2003).

Under a successful discretionary regime, the regulatory authorities could maintain their credibility and make promises to firms. As mentioned in section 2.2, price cap regulation, one of the most successful methods advocated by and applied in UK, is attractive to firms. In order to maximize profits, firms are encouraged to innovate and find an approach to increase efficiency under the RPI-X price cap before the next review. With extra profits, firms can either distribute dividends or re-invest. In a strict regulatory regime without NRAs' discretion, firms will have fewer incentives to innovate. Without discretion, the uncertainty and dissatisfaction from firms could be large, compared with the discretionary regime. Thus, in order to establish a stable regulatory market under the privatized structure, an independent regulatory institution following a discretionary regime is necessary (Li, 2011). This regime will effectively avoid political uncertainty and incentives for business sectors to be uncooperative (Coen, 2005).

As discussed above, the NRAs gain greater legitimacy and independence through building up a tight business-regulator relationship, which helps to develop their own regulatory styles. Yet, in early periods of telecommunication regulation, the biggest issue was how to solve the

information asymmetry between regulators and firms. Clashes lead regulators to take serious political control over firms. In the UK scenario, OFTEL had been deterred by the collaboration between the government and BT (Hall et al., 2000). As a result, the regulatory experience and market liberalization has taken a long period of time to evolve. Fortunately, in the late 1980s, OFTEL began distancing itself from BT by intimating to report uncooperative behaviour to the Monopoly and Mergers Commission (Veljanovski, 1991). Since then, OFTEL started executing the regulation more efficiently. And BT began considering carefully its movements when dealing with competitors, consumers and other authorities.

Unlike OFTEL, the German independent regulator, RegTP has less discretion. The decisive power in regulatory policies is held by the ministry, e.g. the Economy Minister, and the Federal Cartel Office (FCO). The insufficient discretion is revealed by the high volume of appeals opposing RegTP. Market development is discouraged due to the legal costs. Regulatory deployment has slowed down and the complicated regulatory environment acts as a barrier to new entrants. In sum, the unwillingness of business to cooperate with the independent regulatory authorities plus the traditional institutional beliefs in Germany hindered the potential of deregulation.

Although the current regulatory situation in Germany is similar to the early stages of UK, where OFTEL suffered dual suppression from government and the incumbents (Coen & Willman, 1998), the discretionary model of the UK hardly replicates in other EU countries, especially Germany. RegTP was born with an established competition tradition and it had to fight numerous court cases with the Federal Cartel Office. The establishment of the reputation of RegTP requires extra time and effort in such an immature market, compared with the UK. In the future, as the market becomes more liberalized and highly regulated, firms have to acknowledge

the necessity of sharing information and cooperating with the regulatory institution. Negotiation works better than appeals for both regulators and regulatees. The German regulatory development isn't sophisticated enough.

To conclude, regulatory implementation performs diversely across countries, due to the distinct obligation and power of NRAs and domestic regulatory traditions. As the directives from EU may not share the same view with the national authorities, political and institutional clashes could come to light. Some suggested that the uniformity of interpretation, i.e. active monitoring and benchmarking of national regulation, is unexpectedly beneficial (Eberlien, 2003). The uniformity of interpretation can be achieved by gradual inducement and frequent negotiations, and eventually both sides can achieve an agreement and practical regulations (Majone, 2000). For instance, even without formal penalties, the active monitoring procedure is threatening to either over-intervening governments or regulatory institutions that take a *laissez-faire* approach. Therefore, a universal norm based on EU level can act as *the sword of Damocles* to member nations, which helps to maintain the fairness and independence of regulatory authorities. Moreover, a strong connection across countries will be built via this universal norm, which benefits information exchange, personnel arrangement and the creation of a regulatory environment (Coen & Doyle, 2000). Yet, noting that market liberalization and a mature regulation regime haven't materialized, the enforcement of a universal regulation in EU doesn't proceed well today. Due to the limited competencies and influences of independent regulatory institutions, the continental network among different countries' regulatory institutions is still primitive and needs time to evolve.

4.3 Canada

At the last part of the case study section, we study the Canadian case. Beaudry (2010) asserted that the regulators in Canada have been overly restrictive in the past and it is time to deregulate the market via several approaches. Similar to previous cases, market liberalization in Canada started with the Telecommunication Act of 1993, promoting new entrants to the telecom industry against dominant monopolies. The goal of increasing market competition was achieved in two-fold, which are price cap and access pricing regulation (Beaudry, 2010). But in 2006, the Canadian government considered that the obsolete, competitors-tilted regulatory framework was discouraging the industry's innovation. Therefore, the regulatory agency in Canada, the Canadian Radio-Television and Telecommunications Commission (CRTC), realized that the emphasis of the telecom policies has to be on more effective competition.

The idea of deregulation sprouted far before 2006. Since 1997, the principal instrument imposed on incumbents has switched from ROR to price cap regulation. As mentioned in section 2, ROR restricts the portion of the profit that firms can earn, whereas price cap provides limited delegation by letting firms adjust the price bundle. The advantage of price cap regulation lies in the increased incentives to improve productivity. As in the long-run, cost reduces via technological progress, providing greater profit to firms compared to ROR. Yet, the price restriction implements differently on incumbents and new entrants. Before the decision of deregulation, the CRTC constrained incumbents in the following four aspects: bundling restrictions, rate de-average, win-back rule and mandatory unbundling.

The bundling restriction presents as a price floor constraint on incumbents' bundling service. Since incumbents have relatively strong resources and market power, they usually provide service at a discounted price when consumers choose combined services, e.g. buy television and

internet services from the same company. In order to encourage competitive entry, the CRTC imposed the bundling restriction, helping new entrants who have limited services to provide. The rate de-average, which acts similar as price discrimination, consists in charging different prices in different territories, allowing incumbents to maximize their profit; the CRTC prohibited this practice. The win-back rule, designed by the CRTC, prohibits incumbents to attract back consumers that had been lost to competitors before ninety days (CRTC, 2005). And finally, the mandatory unbundling regulation required incumbents to resell “essential” network facilities to new entrants who need them.

However, by re-evaluating these four regulations, the Canadian government decided to retract or loosen them. According to Policy Direction issued by the Canadian government in 2006, the CRTC eliminated the bundling restriction for incumbents (Beaudry, 2010). To reach a higher economic efficiency, the CRTC also removed the rate de-average and win-back rule in 2007 (CRTC, 2007). Yet, the last regulation, mandatory unbundling, was still enforced by the CRTC in 2008. The CRTC asserted that this stepping stone approach for rivals will remain until the competitive powers among players are relatively balanced (CRTC, 2008) and will not be terminated in the next three to five years (Beaudry, 2010). This mandatory unbundling regulation received strong criticism from several scholars. Eisenach and Singer argue that the regulator should consider the entrants’ expanding competency from the low facility rent and thus the CRTC needs to adjust the access price frequently to avoid overprotection for entrants (Eisenach & Singer, 2007). Hausman and Sidak argued that the competitors did not have a high incentive to innovate and establish new technological facilities, as they rely on the low access fees of incumbents’ facilities (Hausman and Sidak, 2005). The mandatory unbundling regulation was considered as a failure by another authorized regulatory institution, the Telecommunications

Policy Review Panel (TPRP, 2006).

Given the fact that the CRTC didn't achieve the government's expected market structure, the Canadian Minister of Industry founded the TPRP to review and improve the telecom regulatory framework (Beaudry, 2010). Different from the CRTC's *ex ante* legislative regulation, the TPRP's methodology followed an *ex post* path. The CRTC tended to design several regulatory approaches for the market in a certain period until the next evaluation, whereas the TPRP advocated that regulators should keep minimal intervention and take action only when a policy objective isn't achieved (TPRP, 2006).

The TPRP suggested the Canadian government to amend the Telecommunication Act, as it does not suit the current competitive environment. However, due to the complex game among political parties and other regulatory authorities,¹¹ the government preferred to issue a policy direction to the CRTC rather than the amendment. This action forced the CRTC to reinterpret the Act and implement political objectives unambiguously (Schultz, 2008).

There is one example which could explain the different regulatory views between TPRP and CRTC. The new telecom technology, Voice over internet telephony services (VoIP) provided cheaper costs than the traditional fixed-line services, as it relies on internet rather than the fixed-line infrastructure (Wijewardena & Andrews, 2005). The CRTC intended to apply the tariff regulations to VoIP services but Canada's Industry Minister, Maxime Bernier, believed that it was against market liberalization and he claimed: "Likewise our role is not to decide which technology is better and should be permitted to grow faster. That is up to the marketplace to decide." (Bernier, 2006) Bernier stood on TPRP's side and looked for a chance to reform the current telecom regulatory framework. The CRTC's VoIP decision has been defended and opposed several times by the two sides. The result induced by the Canadian government is called

¹¹ For further explanations, see Beaudry (2010).

the “forbearance” decision.

The forbearance decision allows incumbents to avoid *ex ante* pricing regulation for the VoIP services. Some believe that those new cable companies have mature experience and low costs for providing the VoIP service (Crandall, 2005). Despite the growing market of internet services to the cable service providers, the main advantage of incumbents is in the fixed-line area, and they need time and investments to develop the VoIP facilities. Due to the Minister’s effort, the CRTC has changed its attitude to a more receptive stand. As the new chairman of CRTC stated: “the government wants to move quickly toward more reliance on market forces in telecom services, less regulation and smarter regulation. I welcome the clarity and I welcome the variation order.” (von Finckenstein, 2007).

The CRTC has spent a long time seeking market liberalization. Although the importance of competition is high when introducing new entrants, an over-intervening regulatory framework should not prolong after the market structure has been established in the Canadian telecom industry. At the initial era of competition, the encouragement and protection to rivals aim at avoiding predatory behaviours from monopolistic incumbents. But if the rivals enjoy the benefits from the regulators too long, such as the four instruments set by the CRTC, technological innovation will lag. The Canadian government has met this dilemma and decided to deregulate the telecom market. Certainly, the arrivals of new technology, e.g. the VoIP in this case, represents a “on time” signal for deregulation, as it creates a technological gap between strong incumbents and relatively weak competitors. Thus, a good timing for phasing out the outdated regulatory framework is the appearance of new services with rapid technological advantage. In the Canadian telecom market, we see that it is difficult to deploy radical regulatory change in such a conservative environment. Under this circumstance, the government should enter in and

mediate between the different groups to reach an agreement, in order to establish an efficient and forbearing regulatory framework.

5. Conclusion

This paper has examined some features of regulations in telecommunication service industry. The author summarized the characteristics of three fundamental and commonly used regulatory instruments: rate of return, price cap and access pricing regulation. Each of them has their own advantages and disadvantages. Regulators should choose the proper method depending on the market structure and the technological development in their own regions.

Country/Region	Year Incumbents Privatized	Year Independent Regulator Established	Degree of Liberalization
China	N/A (CM)	N/A	Low
UK	1984 (BT)	1984 (OFTEL)	High
Germany	1996 (DT)	1998 (RegTP)	High

Table 4. Liberalization Processes of Each Country

In the case study section, we observed that there are three essential processes for 3G telecommunication reforms (Li, 2011), which are introducing competition, privatizing the state-owned incumbent mobile network providers, and establishing an independent regulatory institution. As mentioned in section 4, China Mobile (CM), British Telecom (BT) and Deutsche Telecom AG (DT) were the original dominant monopolies in their respective countries and were weakened by antitrust legislation. But the liberalization moved with different paces in each case (see Table 4). Apparently all three countries have achieved the first step as they are all in the 3G era. Britain has successfully privatized the state-owned company since 1984, as more than 50% of BT's shares were sold to private sectors. The German government took the privatization of the incumbents in 1996, later than the British. The Chinese government hasn't privatized the state-

owned telecom companies yet. Furthermore, Britain and Germany have established their own independent regulatory authorities, which are OFTEL and RegTP. We may say the primary structure of market liberalization is built in these three regions. In contrast, China is lagging behind in the development of telecommunication regulation. Neither incumbent privatization nor independent regulatory authority is adopted. Independent regulatory authorities help to establish a relatively fair competitive environment without political pressure from bureaucratic governments. Therefore, the lack of such an independent supervision department further suggests that the telecommunication regulation in China is immature. Experience from UK and Germany suggests that the evolution of regulatory process is slow. Besides, a sophisticated regulation should be compatible with the change of technology. In other words, the Chinese government should prepare to change their telecom regulation when 4G era emerges and the 4G technological evolution will be a good chance to break down incumbent's dominance, helping the market to achieve higher competition.

In the last examined country, Canada performed a different regulatory framework. The Canadian government reconsidered whether the old telecom regulation has suppressed regular competition of the market via over-protection on new entrants. The Canada Industry Minister asserted to implement a loosened regulatory framework, which contradicts the existing conservative approach advocated by the CRTC. The case of Canada enlightens other developed countries that antitrust legislation in telecom industry could discourage competition when new entrants are overly protected. An old regulatory framework should be re-examined to see the aftereffect. When it does not benefit the regulatory purpose, modification is necessary.

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