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# A Study of Effective Regulation Model in Privatizing the Public Enterprises

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## Abstract

The privatization deems to be an important policy towards to the solutions of public ownership faults. However, the privatizing a monopoly industry could not damage the consumers' interests inevitably. Thus, it is necessary to introduce the government regulation towards to the privatized monopoly industry. The premises of the privatization combined with regulation model are: controlling the privatization of a monopoly industry shall increase the efficiency, improved service quality and lower the costs to consumers.

The method for this research is to review existing literature and study the regulations and the regulation in the developed nations comparing their variations and to find out the most efficient regulation models to design or amend for other nations. The objective of this study is to study the privatization experiences from the existing nations and convert to those nations may need for reference.

At the end, this paper also found that the effective regulation model may not only bring down the costs of the public services, but also improved the efficiency to a near market competition standard.

## 1. Introduction

This research paper looks at price capping theory and considers a case study, which explores incentives and relevant financial and technical points of price capping regulation. The paper will explore the optimal regulation framework which endorsed the price capping regulation framework (Laffont & Tirole, 1993); it will explore the Productivity Measurement with Adjustments for Variations in Capacity Utilization in price capping regulation theory and consider some conclusions and implications.

In 1994, research in the UK power industry found that privatization was not directly related to the improvement of productivity in the post-privatization era. (Burns and Weyman-Jones, 1994). Significantly, the research study on which these findings were based ended in 1993, before the introduction of price capping regulation and before the intensification of industry competition occurred. It missed the valuable opportunity to measure and compare productivity performance under

price capping reduction, versus market competition.

In contrast, recent studies from the electricity association of UK found: that privatization has almost doubled the productivity of the electricity industry. (Electricity Association, 1998, p.55). In the electricity industry, effective price regulation and more fierce market competition have resulted in a lowering of profit margins after peaking in 1989-90 and further resulted in an improvement of service quality. Household electricity costs have fallen at a rate of approximately 2.5% per annum after the privatization of the electricity industry. Commercial users experienced similar discounts and the prices are further negotiable subject to usage. The privatization of local electricity distributors has generally achieved higher profit margins and reduced the need to recruit employees.

The privatization of the gas corporations also achieved similar results. Once profit margins peaked in 1990~1991, prices have continued to fall, reflecting effective price regulation and intense competition in the gas industry. Actual prices for average households have fallen by 2.6% per annum. Commercial and industrial gas prices have also fallen at a rate of 5% per annum. At the same time, service quality has also improved significantly, including the discounted rate of gas pipes, improved safety records, and improved usage of gas pipes. While UK gas corporations have lowered their pipeline buildup and grown their services gradually, new entrants into the gas industry have expanded their business more aggressively to maintain the growth of the total service quantity supplied.

On the whole, consumers only increased their actual expenses in water and sewerage services, especially those consumers who were charged according to the sizes of their properties. However, water and sewerage price increases were supported by industry regulation offices (but the growth rate remained within a permissible range) because suppliers had to meet the European Union criteria and make new investments in infrastructure. Today, water quality and certain service items have greatly improved.

The struggle however, to meet these criteria is reflected by 25% of the sewerage industry which cannot meet the government requirement. The frequency of interrupted

water supply has grown and water pipe leakage has also become a public concern. This is especially problematic as water companies continue to enjoy high profit margins.

As such, the water supply regulator has instructed water companies to implement certain actions to lower the rate of water pipe leakage. The water supply regulator has raised the issues and its intention to tighten regulation and to lower the actual water prices in their next review in 1999-2000. While the regulator may intervene in the case of extraordinary price increases, the UK regulator remains committed to prices which reflect the real cost of supply.

From the perspective of employment, it is clear that total employment opportunities did not suffer from privatization. While privatization may lower employment opportunities in existing firms and organizations, new entrants still require new employees to compete with existing State-Owned-Enterprises (S.O.E.). In the telecommunication industry for example, British Telecom has conducted a few large scale redundancies over the years, but total employee numbers have actually increased. In addition, redundancies are frequently voluntarily and with generous severance packages.

The experience of privatization indicates that, effective regulation can increase productivity, lower prices, and improve quality producing greater economic benefit. Furthermore, the profit margin of privatized enterprises also tends to fall in the longer term. Newly privatized enterprises normally achieve higher surplus as a result of better costs control and less stringent governmental regulations in the initial stages of privatization. The main reason for softer regulations is that this will help gain support from investors in the privatization effort. Upon completion of the privatization, the regulator begins to tighten the conditions of price increases and provides incentives to introduce greater competition.

The Internal Rate of Return (IRR) is also an effective index which deems future profits as zero investment capital while converted into monetary terms. The IRR is being adopted as an instrument of comparison with the Return on Investment (ROI) or the profit margin. Thus, we can compare the ROI with capital costs in privatized enterprises which are regulated. Under competition, the normal ROI will tend to reflect or be close to capital costs. While capital costs are based on lending costs, the proprietor's weighted average is based on equity. In the UK, the capital costs of a privatized enterprise can be viewed as more valuable than government bonds, but in general enterprises it is considered less than the proprietor's equity.

The main reason for this is that while privatized enterprises remained dominant in the market, the regulator must ensure that they possess sufficient

financial capability. This lowers the risk of investing in privatized industries compared to other general enterprises, where capital costs or ROI are also lower. For example, the telecommunication regulation office set nominal capital costs between 8.4% - 13.4% for the telecommunication industry in the UK when actual capital costs are between 5.2%-8.8%. Generally it is true to say that the regulator sets the price capping based on actual capital costs to enable regulated enterprises to achieve 7% of actual ROI.

In some cases in the UK, for example with the British Gas Company and with British Telecom, investors do not receive the pro-normal ROI from investing in privatized enterprises until after an extended period,. The reasons for privatized enterprises achieving pro-normal ROI include the government wishing to privatize enterprises successfully by underestimate the share price and the regulator getting involved with the regulation of pay increases.

## 2. Literature Review

### Comparison between price capping regulation vs. rate of return regulation

Price capping regulation is closely related to inflation. Price capping is modified based on inflation and *the efficiency factor*. *The efficiency factor* is used to reflect the scale of productivity progress and in the UK, is symbolized as X. Price capping regulation is reviewed every 4-5 years. For instance, the price cap for British Telecom was initially set at RPI 3; then reduced to RPI 4.5 in 1989; adjusted to RPI 6.25 in 1991 and RPI 7.5 in 1993.

The objectives of price capping regulation are to amend or simplify the rate of return, which involved the "agreed rate of return" (Littlechild, 1989).

At the start of the privatization of British Telecom, services were 60% under the price capping regulation. Services have currently been lowered to 25%. This has illustrated the maturing of market competition.

Price capping, however, is under attack from many areas. This type of regulation has two major flaws. The first is the lack of motivation to lower the operation costs because increased costs can be transferred to consumers. The second is the ease of over-expanding investment because the profit is expressed as a rate of return on assets and new assets normally achieve a better rate of return (Averch and Johnson, 1962).

At the opposite end, high costs may not be passed on to its customers. Enterprises generate revenue when the cost-down rate is significant lower than efficiency factors. Thus, enterprises commonly improve performance regardless of operations or capital. However, costs and price may move in opposite directions after a period of time which may cause inefficient distribution of resources, (P?MC). Moreover, the public will question the effectiveness of

governmental regulations as high profits continue to be generated

For these reasons, the methods of calculation of price caps are reviewed every 45 years to maximize the results of the regulation. Governments have encouraged enterprises to raise prices within the set and acceptable range as happened in water companies. Government would also permit regulators to adjust the price capping calculation methods in unusual circumstances as in the case of British Telecom in 1991. Governments, however, refrain from intervening with prices once price capping calculations are formalized. Any inappropriate intervention in regulated enterprises would substantially affect internal performance.

Although one research study pointed out that price capping regulation is simpler than the rate of return regulation (Littlechild, 1988, P.56), price capping regulations have more complexity and are dispute in terms of manipulation. For instance, in the case of applying the rate of return regulation, there is much complex data involved such as enterprises assets, finance and forecasts of costs and revenue. For price capping regulation to work, complex enterprises and industry data are needed. However, price capping regulation requires almost as much data as the rate of return regulation. Currently, the regulation office requires more and more complex financial models to forecast the financial status of the regulated enterprise. An effective forecast model would require for instance, a nationwide forecast of demand; a model of costs and productivity relationships; future production costs (e.g. labor costs) and advanced price allocation efficiency in relation to fixed assets.

The objective of the modeling process is to establish a price regulation model. The price regulation model is aimed at assisting regulated enterprises achieve above normal return owing to industry uniqueness or monopoly unless the cost-down margin is lower than the efficiency factors. However, the normal rate of return is very difficult to calculate and requires precise capital costs. The calculation formula always raises disputes between the relevant parties. This also happens with the rate of return regulation law in the US. Apart from capital costs, the size of the asset radix and the methods of amortization are also controversial in both the UK and the US. While price capping regulation in the UK model aims to avoid the flaws in the US model, there remain many questions in the UK model.

The experience in the UK has shown that pricing variables are subject to the asset radix and the negotiated rate of return regardless of price capping regulation or the rate of return regulation. Since assets are sold at a discounted value during privatization, many concerns have been raised in areas such as purchasing costs, replacement costs and book values. For instance, the water company was sold at 90% of its actual

replacement value while the gas corporation was sold at 60% of its replacement value. In this case, it is crucial to evaluate the asset radix of the price capping regulation. Generally speaking, investors should not receive extraordinary profit from their investment amount which should include purchase costs. (Vass, 1997).

In proposing the X factors, the regulators compromised on the method of calculation. They decided on the cash flow model over the short term, which can allow a larger tolerance in net asset evaluation. The objective of the pricing formulae is to provide the regulated enterprises sufficient financial capability to fulfill the current and future public demand for investment.

In this model, the asset value is calculated based on its net book value or current value. The return to investors is over-valued during the privatization. However, if the asset value were calculated during the progress of privatization, for example when the purchase costs are, frequently under valued, more accurate values would result. Although, this may lower windfall gains from the price variation between the actual asset value and its purchase values, this would enable another variation between investors' rate of return and the return rate in the corporate accounting system. Thus, the practice accounts not support a model which went against accounting theory.

After many years of privatization, the regulation office finally took contingency actions to address the issues within privatization. For instance, with Transco (the former pipeline and storage department of the UK Gas Corporation), the monopoly and acquirer association included the asset purchase costs during the process of privatization as part of the index figures. The result of such action caused the windfall gain of investors to disappear and a price fall for its consumers. However when asset replacement is required, this means higher replacement values and service costs would rise dramatically (Fulwood, 1997; Newbery, 1997; Vass, 1997). This would enable a wealth distribution opportunity for customers although this calculation would also enable customers not to pay for actual costs. Asset evaluation became a good case study. Simpler regulation was insufficient as the situation turned complicated and controversial. Also, the UK regulator frequently intervened without following its review schedule when any consumers' disputes arose or new competitors entered the market. These actions caused many disputes and complaints between the regulator and the regulated enterprise. For instance, the telecommunication regulation office intervenes more times in British Telecom than when it was a State-Owned-Enterprise. The regulation office intervened in pricing, quality control, the rates equilibrium control and in consumer satisfaction matters (Souter, 1994:p.109). The CEO of British Telecom, Sir Valence, criticized the regulation environment in the UK

as hostile and unpredictable (Lapsley and Kilpatrick, 1997:p.81).

This also occurred in other industries. The relationships between the gas regulation office and its regulated enterprises were on the edge of rupture. The water regulation office intervened twice during the first five-year regulation period. The regulation office forced water enterprises to lower prices so as to share profits with its customers and even intervened in the bonus scheme of the enterprise. As a general rule in price capping regulation, bonus schemes of the regulated enterprises should not be an issue for the regulation office.

The regulator may amend the code of an unpredictable game. In this way the regulator and the regulated enterprises shall establish a stricter "regulation contract" or negotiate a clear code of conduct between two parties (European Policy Forum, 1996, Parker, 1997b). The price capping regulation since 1983 was designed by Professor Littlechild to minimize unnecessary and detailed governmental intervention. While it failed to minimize governmental interventions, it is highly efficient in encouraging corporate management to reduce internal inefficiency and lower service costs. The results of all types of governmental interventions in corporate strategies and economic behavior remain questionable but it is clear that negative effects have resulted.

Unexpected regulation intervention may lower the motivation for enterprises to improve efficiency because the improvement rate must exceed the X-factor to generate short term profits for shareholders. The major motivation for the regulator to pursue better efficiency is for short term profit and to be able to use this as an important index for corporate improvements in efficiency. However, regulated interventions aim to redistribute profits generated from this efficiency improvement to customers rather than shareholders. Regulated enterprises may lower efficiencies and waste resources to minimize profit and therefore avoid its prices being reviewed by the regulator. Similarly, there is a likelihood of wasted resources and lower efficiencies if the regulator intervenes in bonus distributions to shareholders.

The valuable experience of the UK regulation model that other nations can take on board is that price capping regulation is not simpler than rate of return regulation and does not use less information. In fact, both regulation models required the same amount of information. Furthermore, the regulator should amend regulations according to the review schedule and should not attempt to intervene to enhance operational efficiency. The regulator may intervene in regulated enterprises when there are pressures from governments, consumers and market competitors.

Regulators feel intervention is necessary to protect consumers from the high profiteering of regulated enterprises. Price capping regulation should introduce reforms to replace an annual bonus system or the profit sharing system (Burns, Turvey and Weyman - Jones, 1995). Profit sharing methods have caused a high level of concern in the UK and worldwide, as the design and costs incurred by the profit sharing system were disputed and not discussed revealing the intention of some enterprises to hide profits.

The profit sharing system is based on the price capping regulation but may be misunderstood and seen to be another system altogether. In fact, price capping regulation includes the profit sharing system. High profits are designed to show in following review periods, and do not reflect annual systems of profit sharing system.

We can prove the theory in the following case. Assume £1 per annum was generated from efficiency improvement. We assume an 8% conversion rate and that the cost-down would reflect in higher profits. If all things remained equal, the final benefits would be distributed as 32% to investors while 68% would be distributed to consumers.

The detail calculation per below:

$$\text{PV of } \text{£ } 1 \text{ for 5 years @ } 8\% / \text{PV of } \text{£ } 1 \text{ in perpetuity @ } 8\% = 3.99/12.49 = 31.95\%$$

The premise of this formula is that the net value of the efficiency improvement per £ 1 (assume 8%) would be returned to enterprise investors per five-year review period. After the five-year period, the net value of the efficiency improvement per £ 1 would be returned to consumers. Furthermore, the X-factor requires that 32% efficiency improvement benefits be distributed to enterprises investors while the rest of the 68% is distributed at a lower price to all consumers. The above 32/68 proportion is based on the assumption that the regulated enterprise shows improvement in the first year of the five-year period. If the improvement takes place after a few years, consumers enjoy greater benefits after the distribution. If the premise of the above calculation did not change till the fifth year, then the proportion between consumers and investors would be as high as 7/93. Therefore, price capping regulation is a profit sharing system where the timing of the benefit distribution is disputed. In price capping regulation, the consumers could be awarded their share of the profits ahead of the Investors.

### 3. The theory of incentive regulation

The theoretical foundation of incentive regulation in public utilities is the notion of optimal regulation. At present, there are two performance evaluation directions of the incentive regulation theory - the price capping regulation and the yardstick regulation. The Incentive regulation aims to induce regulated enterprises to improve efficiency, quality and the overall performance. The regulator adopts an intervention strategy to encourage the industry to embrace competition, to award those who uphold the regulation and punish those violating the regulation. Incentive regulation in public utilities adopts a framework of principle-agent relationships, where the regulator is the principle and regulated enterprises are the agents. Both parties tend to maximize its effective functions; where the regulators aim to maximize the social welfare function while regulated enterprises aim to maximize profits.

The economic incentives of price capping regulation have forced telecommunication network operators to increase or maintain service quality. According to one case study on telecommunication network operators, a substitution relationship was found between effectiveness and quality (Northworthy & MacDonald, 1994). The substitution relationship literally means consumers still pay the same prices even though service quality is down graded. Therefore the quality index should be incorporated as a contingency method for the calculation of total productivity. Thus, as service quality decreases, total productivity should fall accordingly. For instance, there are 18 states in USA which include 'service quality' as an item in its call rate evaluation. There are three states which include 'service quality' in price capping regulation schemes. Quality index data was collected from the open data of ARMIS (Automated Reporting Management Information System). However at present, there is not any reputable open data available in Taiwan.

Incentive regulations which aim to be successful in the telecommunication industry should include a thorough price index. A price index should incorporate significant indices and performance criteria such as the total turnover of the telecommunication services, customers groups, total demand, a telecommunication quality index, capital costs and a measure for efficiency. Performance measurement indices play a significant role in total productivity, marginal costs, quality and technical improvement (Northworthy and Tsai, 1999: p?). Performance indices enhance price capping regulations and the implementation of incentive regulation by maximizing the function of economic incentives.

### 4. The foreign regulation experience

This section explores the advantages and disadvantages of the public utilities privatization model in the UK. This model is now becoming the worldwide privatization template.

The most significant advantage has been to enable former state-owned enterprises (now privatized enterprise) to improve efficiency and to increase benefits for investors and consumers. In general, consumers benefit in two ways - from lower service costs and higher service quality, except in water and sewerage services. In the case of water and sewerage services, low levels of investment prior to privatization resulted in the need for the investment of large funds to improve service quality. These investment costs were transferred onto the consumers. Investors have benefited from privatization regulation laws, sometimes with extraordinary profits. These huge profits have frequently raised much public concern.

On the downside, price capping regulation law did not work as easily as formulated in 1983. Price capping regulation must incorporate operational costs, capital costs and demand growth into the calculation model. The regulated enterprises must also agree to the capital costs, and asset evaluation as per the requirement of the price capping regulation. Asset evaluation is an area of dispute because of the huge variance among the share price, net value and replacement value. This is commonly regarded as if the enterprise privatized at discounted values.

It seems that privatization under regulation achieves better performance, especially when a more appropriate system is still in the making. The regulator and the regulated enterprises should learn from the mistakes of regulation failures. A significant phenomenon was the reduction in high profitability at the early stage of privatization after tighter regulation was introduced and competition was intensified. Those nations interested in privatization and the privatization regulation may look to the UK experience.

In particular, the following points may be noted:

(1) The direct intervention of government departments into privatized enterprises may not offer the best solution and incentive for efficient and effective regulation. In privatized monopoly enterprises, a regulation office with a detailed plan and review mechanism would offer more effective economic performance and improvement and would benefit both investors and consumers.

(2) The positioning of the regulation as an opposing force between the regulator and the regulated enterprise is another point for consideration. While business aims to make profits for its investors, the regulator aims to minimize the profits from the regulated enterprises in order to benefit the consumers. This conflict can be seen to strengthen the relationship between the regulator and the regulated enterprise. The relationship is optimal at a certain level of opposition. Conversely, concerns are raised if both parties have close and steady relationships. This leaves room for unethical exchanges of information and even lobbying on the part of privatized enterprises to receive favorable treatment

and weakening the protection of consumers.

(3) Price capping regulation may not be easy to implement as it requires planning and as much information as the rate of return regulation. However, price capping regulation can lead to lower supply costs if spot regulation interventions were not allowed prior to the set review date. In the long term, the benefits resulting from lower costs would benefit consumers. The only problem is the presence of high profits in the short term, which would attract public criticism.

(4) Huge profits generated by regulated enterprises raise public concern and complaints are targeted at monopolized enterprises. Regulators are often pressured by the public to intervene in regulated enterprises that enjoy high profits. However such intervention lowers the efficiency motivation of the price capping regulation within the regulated enterprise. The difference between the price capping regulation and the rate of return regulation would diminish within the term of the review as the huge profits are removed.

(5) Regulation simulates or serves as a substitution for competition in the marketplace to enable the regulated enterprises to improve its performance. However unlike the true competition, man-made regulation cannot fully stimulate performance improvement and further raises some public concern. Thus, the regulator is likely to introduce more competition as long as this leads to improved economic performance. Prior to 1999, the telecommunication, gas and power generation industries remained State-Owned-Enterprises. The water supply industry remained monopolized even though the UK government tried to aggressively introduce competition into the industry (DOE, 1996; Robinson, 1997). Regulations should enable and encourage newcomers rather than acting as a hurdle into the industry.

(6) In the UK, the regulator must report to the related minister and the parliament regarding all regulatory actions. At the same time, the independent regulation must take place from the substance mode of the regulation rather than the formality mode. The work of the regulator lies in its expert opinion in its area of jurisdiction and the continuity of its policies rather than its reporting function. The work of the regulator should also be less concerned with social and political issues such as income redistribution. The balance between independence and public accountability could be threatened if the regulator is required to report its activities to the general public and if political interventions overwhelm its independence. In some nations, an over-centralized, single regulator is less acceptable than a regulator with open and democratic procedures. Furthermore, a committee-style or panel-type of regulation organization is replacing the existing single regulator model and public hearings and juridical examinations are added to enforce the regulations.

The UK experience has shown that effective regulation and privatization can energize a lethargic S.O.E., and can benefit consumers. It is important to note that the UK model is built on a specific political and economic system. Thus, the UK regulation model cannot simply be transferred to other political systems or nations but must be adapted and modified to the local environment.

### **The experience of price capping regulation in both the UK and the US**

There are two methods of price capping regulation in both the UK and the US. The first is gain-sharing price capping regulation and the second is the sliding-scale price capping regulation. (Need more information on these 2 types of regulation. How does this relate to the next paragraph?)

In the telecommunication industry, network operators can benefit from the huge economic incentives brought about by regulation and can share these benefits with their customers. This can occur if price cap menus take into account the distribution mechanisms needed when setting the range of the X-factors. As the X-factors increase, the lower proportion of productivity profits is shared with customers. For instance, in 1995 in setting the federal price capping menus, the FCC (the Federal Communication Commission, of USA) raised its X-factors from 3.3% to 4.0%. In this case, if the telecommunication network operators chose the smallest X-factors, then they would have to distribute all the targeted productivity profits to their customers. If the network operators chose the largest X-factors, then they would not have to distribute any of the targeted productivity profits to their customers. Furthermore, if the network operators chose the median X-factors, then they would have to distribute the targeted productivity profits to their customers proportionally.

This scenario has led to five out of the seven Regional Bell Operating Companies (R.B.O.C.s) choosing the maximum X-factors while claiming that average productivity growth was not expected to exceed 3%. It is obvious that there are issues regarding asymmetrical data existing between the regulation office and the regulated enterprises. Telecommunication network operators tend to partially hide costing information in order to seek higher prices which then justify the higher X-factor target.

Therefore, in such cases, selective price cap menu regulation can more clearly reveal the cost structure information in regulated enterprises and would add to the amount of information held by the regulator. This type of regulation would resolve cases of asymmetrical data.

Price capping regulation and the X-factor has played a significant role in economic incentives. Apart from being an index for costing structure and operational

performance for telecommunication network operators, it is also an entry point for incentive regulation by the regulator.

In the US, the process of outlining and finalizing the regulation was open and consultative. The FCC organized many open conferences in order to gather information and opinions across the board. This led to the development of a strategy to support the telecommunication network operators. The FCC, however, decided on the final version of the price capping regulation.

The key points in the regulation included the calculation of X-factor, the amendment method of the X-factors, the sharing system and the linkage of X-factor, and regulation for external costs. Thus, the procedure was justified as conscientious but without being aggressive.

In the US, however, the FCC was empowered to legislate its own regulation which is not the case in other nations, such as Taiwan. If Taiwan adopted the same kind of regulation, for example, it would probably cost more to implement. The Department of General Telecommunication (DGT) may encounter costs from lengthy time delays as parties with vested interests attempt to intervene in the regulation by lodging relevant proposals to parliament for auditing. Unlike the UK experience, where the regulator negotiates the price capping formula with network operators directly and proposes all necessary indexes, such as the X-factor, the DGT in Taiwan does not possess the necessary power and may be further undermined by public skepticism.

### **5. The regulation experience in Taiwan**

In general, the telecommunication industry has begun to experience liberalization due to breakthrough technologies, a booming service industry and government awareness of the need for global competitiveness. The US began its liberalization of the telecommunication industry from the 1980's, and this trend was followed by many other nations including the UK, Japan, Australia, New Zealand and members of the EU.

In Taiwan, the government has not been able to ignore global trends of liberalization and faces strong demands from local business and foreign Telco investors alike. This has enabled Taiwan to increase its competitiveness in a couple of ways. Firstly Taiwan has been able to transform itself into a regional transit center and secondly, it has been able to join the WTO and thus meet the demands of liberalization from local business and foreign investors.

In Taiwan, the telecommunication industry underwent a fundamental transformation based on two factors. The first factor was the speed of breakthrough technology

which dynamically transformed and made possible the liberalization of the domestic industry. The second factor was the liberalization and deregulation of the telecommunication industry worldwide. The liberalization of the telecommunication industry in Taiwan was based on fair competition enabling new market entrants to compete with the existing monopolized operator. This further increased competitiveness among the worldwide telecommunication industry.

Structural and legal reform began in Taiwan in January, 1996 when three telecommunication laws were legislated. The monopolized industry was privatized into Chung-Hwa Telecom, separating operational and administrative functions. In 1997, the telecommunication industry was further classified into two categories of business operations - the mobile networks and international direct dial business (IDD). The market continued to be liberalized.

By the end of 1997, the mobile network carriers had been liberalized. By 1999, the satellite carrier's network had been liberalized. By 2001, the telecommunication industry had liberalized all its services to all its licensed service carriers including the local exchange, long distance calls, international direct dials, broadband exchange and data exchange.

In May, 1997, the regulator of the telecommunication industry in Taiwan, the DGT, announced that it intended to replace the existing remuneration regulation rate with price capping regulation. The objectives of price capping regulation were to enable telecommunication network operators to have greater flexibility with pricing and profit while battling in the fierce competition environment under liberalization. In order to achieve the objectives, the price capping regulations included the incentive of costs reduction, and limited the previous monopolized advantages of Chung-Hwa Telecom in the market.

This research study looks at the process of legislating the price capping regulation which is economically oriented and based on economic and technical considerations. It further discusses the directions of governmental regulations and the process of formulating a more optimal regulation which is productive, rewarding and innovative.

According to the 26<sup>th</sup> Clause of the telecommunication (where is this from? Is it a charter, is it a piece of regulation? Please define): price capping regulation is only suited to the 1<sup>st</sup> type of telecommunication business and stands as the general code for the industry (Mao, 1998). At the moment, currently the Department of Transportation has amended this clause.

Price capping regulation was first presented by Littlechild in 1983 and then adopted to implement the



privatization of British Telecom in 1984. Price capping regulation was further adopted by the Federal Communication Commission (FCC) in the US during the early nineties. Currently, the theory of price capping regulation is widely adopted in telecommunication liberalization around the world, in countries including the USA, the UK, Canada and many European nations. The main reasons for the wide adoption of the theory are the incentive for economic efficiency and performance regulation. The most distinguishing characteristics of price capping regulation are that telecommunication network operators must achieve productivity goals set by regulations and that the rewards may be greater than under the previous remuneration rate regulation.

The idea of price capping theory with the X-factor of the price capping regulation was based on the goal of growing productivity. This concept also reflected if the telecommunication network operators had achieved the productivity goal, and then formulated the price within a maximum price range. If a telecom network operator achieved the productivity goal of the designated period, they were entitled to keep the super profit after deducting all operational costs and normal profit margins. The regulator would then reset the price capping maximum for the next period based on the performance of the previous period.

The productivity growth rate (the X-factor) is a significant factor in the study of price capping regulation which is used to set productivity growth targets for telecommunication network operators. Price capping formulae need to achieve effective economic efficiency incentives and performance regulation. From the point of view of consumers, higher productivity growth targets mean higher economic performance and higher economic returns could easily be achieved. In the longer term, price caps would be adjusted downwards by telecommunication network operators. The lower productivity growth target would cause a higher price capping goal. Thus, the network operators would achieve a higher rate of return and after-tax profit with costs-down operational policies and an improvement of service quality.

The incentive mechanism of price capping theory is derived from asymmetric data in an optimal regulation framework. Under price capping regulation, the regulator cannot easily predict the real costs of every type of telecommunication service and may not be able to accurately forecast cost savings due to managerial and technical improvements. However, the regulatory office may be able to design price capping formulae or various regulation contracts to induce telecommunication network operators to pursue maximum profit and cost reduction strategies. The regulation office may be able to design optimal price capping formulae or suitable regulation contracts which encourage telecommunication network operators to pursue profits, by selecting the best cost-down measures

which reflect actual costs.

When formulating the incentive mechanism of price capping regulation, the regulatory office must take into account two factors. The first factor is that network operators may reduce service quality to achieve cost-down results and the second factor is that network operators previously achieved profits from cross subsidization by operating both regulated and non-regulated telecom businesses.

For instance, in the U.S, local exchange carriers (L.E.C.s) operating in the local distance call market had to compete against inter-exchange carriers (I.X.C.), which were permitted to operate a local exchange service to compete with existing LECs. When there is cross subsidization, the long distance exchange and local exchange may not compete as fiercely as expected. Moreover, the improvement in the service quality of the LEC would be very limited if there were no real market competition.

## **6. Conclusion and its implications**

This paper discusses the direction of governmental regulation in the area of price capping regulation and how to formulate optimal regulations prioritizing productivity, incentive investment and innovation. Laffont & Tirole (1993), endorsed optimal regulation as the goal of any price capping regulation framework. Price capping regulation and the method to induce more cost effective productivity and quality was further explored.

After the WTO classified the telecommunication industry as a global trading system and liberalization led to a maturing of the of the telecommunication industry, it was seen that price capping regulation would be better suited to a competitive market structure. Therefore this research is based on a new type of dynamic economic model with capital input. It has explored the incentives of price capping regulation and illustrated the measurement of total productivity in price capping regulation. It has looked at price capping regulation and sliding scale regulation from both economic and technical viewpoints during the process of liberalization in the telecommunication industry.

In the US, price capping regulation in 1991 and the Telecommunication Act of 1996 achieved several outcomes. Some phone users enjoyed the benefits of updated technology and there was competition among local exchange carriers. Furthermore proposed production growth goals were achieved despite fierce competition.

Many economic and finance regulation theories are based on asymmetric information. Incentive mechanisms of price capping regulation are based on telecommunication network operators having a sound

knowledge of costs and know-how in order to setup the incentive contract. Telecommunication network operators claim that price capping regulation has caused a drop in productivity, but in the case of the UK and the US, it has been shown that telecommunication enterprises can achieve high profitability from efficiency and increase benefits to customers. To ensure success of selective price capping regulation in the US, telecommunication network operators were allowed to choose preferred contracts in authorized business categories.

To enable the general public to benefit from increased productivity and quality, and lower prices from competition, price capping regulation formulae must incorporate a design of the optimal service index which includes measurement of service quality. While the substitution relationship between productivity and service quality has been proven in the US, in an emerging market, like Taiwan, the measurement of service quality methods and research methods must be linked to the index of price capping regulation.

Current accounting procedures do not offer the best information-gathering system for the telecommunication industry. Telecommunication network operators are frequently not called on to demonstrate the performance of the industry and pricing is not based on individual costs. In Taiwan, the DGT and Chung-Hwa Telecom came under public attack with complaints of unfairness, sloppy administrative procedures and lack of openness, when they tried to implement the call rate rationalization by addressing the telecommunication rate adjustment scheme. Public criticism also focused on the lack of detailed information for example in the case of the method for calculating the amortization of personnel costs. The difficulty was that the system did not distinguish between each type of business costs in the amortization of costs. In Taiwan, the accounting system for the telecommunication industry is based on the unified accounting procedures of the auditing department of the Executive Yuan, which is calculated based on departmental rather than on the rate of specific services or amortization.

It is clear that the research and control of the costing structure is very important. Thus it is crucial to establish a cost accounting system as a first priority. Telecommunication network operators must comply with the accounting procedures of the governmental auditing system and with corporate costs analysis and operating income accounting.

The findings of this paper indicate that regulation issues in the telecommunication industry are not simply domestic issues, but are a global phenomenon. In the future, the telecommunication industry will be faced with domestic and international competition. Therefore, consideration must be given to foreign competitors when formulating regulations. In this regard, the WTO has

played a significant role in the telecommunication industry by regulating competition and by acting as a major influence on the liberalization of the fundamental structure of telecommunication services and the direction of operations. As a result, Taiwan has adopted the new regulation model more quickly in order to improve operational performance by domestic telecommunication companies. In addition, the government is paying closer attention to the WTO conferences and decisions which help align the domestic telecommunication industry in Taiwan with international competition.

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