

Economic Impact of Unbundling Regulation and Deployment of Broadband Network in Public Utility Economics

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1. Genealogy of the Traditional Theory of Industrial Organization

1.1 Harvard School

Traditional telecommunications have spread through natural monopolies created by the application of public regulation, which balances supply and demand. However, rapid technological innovation has diminished the prevalence of the said natural monopolies, and the field of telecommunications has become increasingly reliant on the market mechanism.

This paper refers to the revision of the Telecommunications Business Act, which has led to efforts to promote broadband through competition rather than public project regulation. Before analyzing the causes of the spread in the next chapter, I will examine the economic meaning of public project regulation, which has encouraged the spread of traditional telecommunications services in industrial organizations. This examination aims to show that traditional public project regulation based on economies of scale and natural monopolies will not be applicable to the promotion of broadband.

In considering telecommunications as an industry, it will be necessary to make deliberations from the viewpoint of industrial organizations. The telecommunications business, which is the topic of this paper, is a network industry composed of energy businesses such as the electricity and gas industries, and transportation industries such as airlines and railways.

Telecommunications will be studied herein as a network industry that differs from other industries because unique market principles operate within it. In this field, as reflected in the revision of the Telecommunications Business Act, technological innovation and distinctive industrial characteristics affect and change the mechanisms of competition.

This makes it appropriate to consider the industry an industrial organization. The theory of industrial organization is greatly influenced by the political principles underlying the foundation of the United States of America (US), which are rooted in US society. This theory originates from the Sherman Antitrust Act, which was enacted in

1890 to target noncompetitive monopolies that undermine the spirit of democracy.

This anti-monopolistic trend encouraged active involvement in economics by the government, and led to full-scale studies conducted from the viewpoint of industrial organizations. During the Great Depression, which was triggered by Black Thursday in 1929, a massive number of smaller US businesses went bankrupt, and in 1938, US President F. D. Roosevelt established the Temporary National Economic Committee (TNEC) in order to revive the economy.

The TNEC submitted its final report in 1941, which clarified that the excessive concentration of economic power within the US economy was threatening the market mechanism based on free competition¹. Thus, studies of industrial organization began in the 1930s with E. S. Mason as the key figure, and the Harvard School, which was mainly composed of researchers from Harvard University, proceeded to theorize antitrust policies.

Based on the idea that the market should be realistically recognized, they concluded that actual markets were not fully competitive, and acknowledged the existence of monopolies. They also thought that actual markets were functioning as a combination of monopolies and complete competition.

The Harvard School believed that a certain extent of interventional regulations were necessary in order to allow markets to operate properly, and struggled to discover means of eliminating market clout that derived from monopoly rather than competition in order to restore the functioning of market principles. In this regard, Tadao KONISHI presented the following observation². (Material within parentheses is translated by the author hereof.)

Their [the Harvard School's] anti-trust policy direction is more rock-ribbed than ever. To say nothing of [their] strict regulations on mergers and cartels, they argue that existing large enterprises must be split up in order to restore a competitive environment. And in the postwar era, anti-trust policies were based on the policy theory of this school and implemented strictly. This trend was at its peak probably around the latter half of the 1960s.

In this way, the traditional theory of industrial organization was constructed by combining the economic approach of the Harvard School with antitrust policies. This theory was espoused by E. S. Mason and J. S. Bain, who advocated the Structure, Conduct, and Performance (SCP) paradigm and strongly maintained anti-monopolism as defined by the concentration-profits hypothesis³.

In order to explain the market economy, the Harvard School analyzed the scale of market performances according to structural requirements based on the concentration

of supply and demand. It argued that markets in which the concentration ratio is high would suffer extensively from a number of monopolies.

It also contended that it is meaningless to regulate only corporate activities if the performances of a market are not good enough. In such cases, it said, structural measures need to be taken in order to change not only corporate activities, but also market structure. For this reason, it advocated structuralism as means to restore the functioning of the market mechanism.

This concept was adopted in many places in the US as a structural regulation method aimed at regulating and eliminating the influences of monopolistic enterprises, and was developed with a focus on anti-cartel measures. A specific example of the outcomes of this adoption is the well-known breakup of IBM in 1969. As for telecommunications as it relates to this paper, cases such as the breakup of the American Telephone and Telegraph Company (AT&T) in 1974 have also influenced industrial reorganization.

1.2 The Rise of the Chicago School

The Chicago School, which was mainly composed of researchers from Chicago University, disagreed with the Harvard School's structural mode of thought that emphasized interventional regulations. The Chicago School emphasized the autonomy of the markets and their ability to adjust automatically, and expressed doubts about excessive interventional regulations. It was relatively optimistic about the functionality of the market mechanism and doubted that the negative effects of monopolies would last.

Instead, it believed that monopolies may enjoy temporary success but will collapse eventually without sophisticated managerial methods. For example, if a monopolistic company is highly profitable, other companies will enter the market. If they do so quickly, the market mechanism will ultimately divest the monopolistic company of its monopoly, assuming that the company only relies on the advantages procured through said monopoly.

So ran the argument of the Chicago School. In cases where a monopoly enjoys large profits not based on efficiency, other companies will enter the market and the monopoly's profits will decrease to a competitive level. In other words, a monopoly that continually secures large profits is highly efficient. Therefore, if the structural approaches advocated by the Harvard School emphasize the market mechanism, they will not only have no positive effects on market functions, but will diminish the monopoly's efficiency.

Simply put, the difference between these two schools lies in the fact that the Harvard School adopts a structural viewpoint in its emphasis on the effect of market structure on market conduct, and that of market conduct on market performances in

contrast to Chicago School, which emphasizes the cause-and-effect direction of “market structure→market conduct→market performances.”

Even if economies of scale are functioning and monopolies are inevitable, no industrial regulations by the government will make the market more efficient. On the contrary, government intervention will artificially create a monopolistic market that seeks governmental protection and will lead to inefficiency. This is the conclusion of the Chicago School.

The ideas of the two schools can be summarized as follows. The Harvard School considers large monopolistic companies an evil, and criticizes them for focusing on the increase of market concentration via noncompetitive means in order to earn excessive profits. Conversely, the Chicago School considers such monopolistic companies powerless in the market mechanism; therefore, it avers that the government should avoid intervening in the market frequently so that the market mechanism will not collapse.

This paper is based on the idea that the principles applicable to the field of telecommunications cannot be derived from these traditional theories of industrial organization because the theories are too simple to describe today's problems. Such theories or arguments between schools serve as textbooks for desk studies on basic economics, but are difficult to apply to today's economic challenges.

The issues that arise in modern industries as deregulation cannot be described as homogeneous phenomena on which the theories of the two schools are based. In particular, issues relating to the field of telecommunications require that we reckon with the interdisciplinary aspects of the field's development, such as those relating to engineering or other technological factors. I will position these two schools within the sector of telecommunications, which I define as a unique industrial organization, in the following sections hereof. In addition, I will endeavor to formulate the necessary measures for establishing new industrial analysis methods in reference to the genealogy of theories of industrial organization.

1.3 The Rise of the Post-Chicago School

As mentioned above, the traditional theories of industrial organization are imperfect. The Harvard School's approach reflects acknowledgement of a lack of competition in a market that is not completely monopolized; however, it has failed to suggest a methodology for the empirical study of this lack of competition. In contrast, the Chicago School uses microeconomics in order to analyze the markets empirically, but its models are oversimplified.

It only provides dualistic models of either monopoly or full competition, and its explanations are weak. As these approaches of the theories of industrial organization to inadequately competitive markets progressed, game theory appeared on the scene, and

growing demand emerged for the establishment of methods based on microeconomics that would clarify strategic interdependence in the markets.

Amid this transition, the limelight fell on new theories of industrial organization suggested by the Post-Chicago School, which was represented by key figures such as R. Schmalensee. This school was characterized by its possession of functions that compensated for the deficiencies of the traditional theories of industrial organization presented by the Harvard and Chicago Schools. In particular, researchers from the Post-Chicago School began to conduct empirical analyses of the application of anti-monopoly laws and its effects on the markets, which the structuralism of the Harvard School had failed to address.

In summary, the Harvard School advocates the strict implementation of anti-monopoly measures to solve the problem of inadequate competition in the markets, the Chicago School advocates analyses using microeconomic models, and the Post-Chicago School tries to combine the strengths of the two in its construction of empirical analysis models.

Schmalensee proposed that game theory should be treated as a model for policy application and applied to industrial organizations, since the theory can reasonably explain the pluralism of equation, bounded rationality, and the like, which had often been seen as problems in applying anti-monopoly laws. However, he would not state that game theory could explain all the problems in an industrial organization, which influenced subsequent research⁴.

Regarding the influence of the theory of industrial organization on economic measures in the US, Tatsuaki NISHIDA presented the following observation⁵:

International competitiveness of the USA in decline → Relaxation of the anti-trust policies advocated by the Harvard School → Confidence in auto-regulatory mechanism of the markets as advocated by the Chicago School → Reagan administration's adoption of economic measures proposed by the Chicago School and recruitment of legal personnel from the school → Conception of "contestability theory" as mentioned hereinafter

The high economic growth rates of Japan, China, the EU, and so on prompted the US to place importance on economic measures aimed at strengthening its international competitiveness in order to maintain a "strong America." This eventually led to the strengthening of the industrial organization, and during the 1980s, large-scale deregulation measures were implemented to boost the competitiveness of industry.

In particular, the electricity, transportation, and telecommunications industries, which are known as the network industries, were starting to gain the recognition of a

number of other industries as an important network infrastructure, thanks to the development of science and technology. Therefore, enhancing the competitiveness of the network industries was considered an indirect requirement for enhancing the competitiveness of other industries.

The role of the network industry is, as stated by Takanori IDA⁶, to perform the connection function, which is one of the said industry's characteristics and invests in it the responsibility of providing "the infrastructure for infrastructures." Discussions of "network externality," which IDA presents as another role of the industry, are omitted herein, but the telecommunications industry will be researched in accordance with the theory of industrial organization.

In the next sections, I will examine the applicability of contestability theory, which in theory supports the deregulation of the network industry.

2. Conception and Application of Contestability Theory

2.1 Contestability Theory in Terms of Industrial Organization

Contestability theory was advocated by W. J. Baumol et al. In a completely contestable market⁷, firms that drop out of the market bear considerably reduced sunk costs, and firms can enter or withdraw from the market freely and completely. Moreover, the structure of such a market does not have to be completely competitive.

If new market players can minimize sunk costs (the costs of investment capital such as production equipment, research and development, publicity, and the like, which cannot be diverted to other uses), they will be encouraged to "hit and run." That is to say, they will enter the market seeking short-term profit, and abruptly withdraw from it before being counterattacked by other existing players.

Kenichi FUKUMIYA made the following connection between traditional theories of industrial organization and contestability theory⁸:

Based on the concept of the completely contestable market and subadditivity of cost function, efficient industrial organizations will consist of advanced market structures involving natural monopoly ... I demand that the linked paradigm of structure-conduct-performance, on which the traditional market analyses are based, be severed, and that the standard of application for the competition policies be revised.

When contestability theory was developed, it was simultaneously expected to

solve the structural problems of both monopolistic enterprises and completely competitive markets in the industrial organization. At that time, as mentioned in the following sections hereof, privatizations and breakups of monopolistic enterprises in the US economy were proceeding on a deregulatory basis.

However, contestability theory may not apply to the process in which the transport and electricity sectors, which are network industries, and the telecommunications sector, which is the subject of this paper, turned from natural monopoly toward the market system.

The conception of contestability theory is linked to the global trend of deregulation that took place mainly in developed Western countries during and after the 1970s. This trend was due to the collapse of Keynesian economic policies, and resulted in the streamlining of social systems through the reallocation of resources to draw upon private sector vitality and market competitiveness. A flock of network industries, including the telecommunications industry, rode this trend. Toru MURAKAMI referred to it as follows⁹:

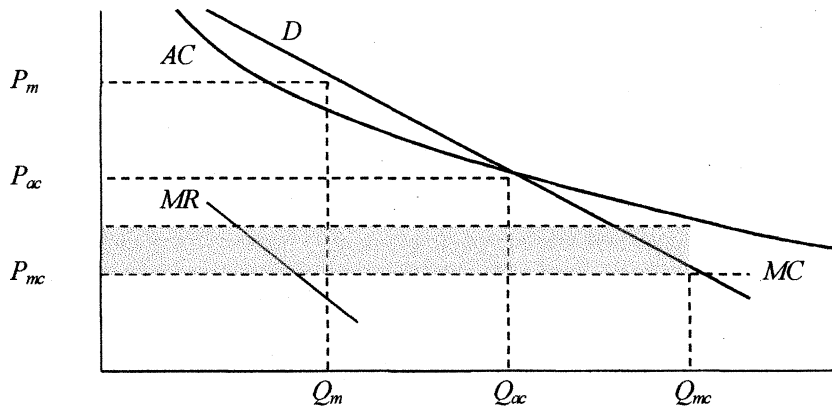
The declining growth of productivity in and after the 1970s is partially attributed to government regulations, according to relevant sources. In addition, increasing regulations and regulatory expenses caused the government regulations to be reviewed, and the relaxation of these regulations and introduction of the element of competition were regarded as one of the important means for industrial revitalization.... Appearance of alternative services in response to diversified demands for various services and technology innovation diminished the necessity of public supplies and caused the management of regulatory industries to deteriorate.... The purposes of such reviews and relaxations of the government regulations are roughly classified into the following two factors.... The first is to reduce the range of government regulations in order to realize efficient administration and ease financial burdens.... The second is to introduce the element of competition in order to vitalize private economy.... The above-mentioned purposes correspond to the following two matters, respectively. The first is the loss of natural monopoly accompanied by the change of circumstances as a result of failed regulations.... [The second is the] appearance of alternative services in response to diversified demands and technological innovation.

In this way, the network industries, including the telecommunications industry, experienced the privatization of main suppliers and the formation of competitive markets.

2.2 Contestability Theory and Telecommunications

Since an enormous amount of fixed capital (installation and equipment) is required to supply traditional telecommunications services, social costs render it inefficient for a large number of companies to be engaged in the market. That is to say, in this type of industry, it is more efficient to allow only a single supplier to provide the service than to let several suppliers do so. Therefore, traditional telecommunications can be described as an industrial organization with a large extent of natural monopoly.

Since the telecommunications and other network industries are almost public, natural monopoly was seen as the most appropriate way for them to provide services. In such industries, regulations to create the most appropriate form of resource allocation were imposed on businesses willing to enter or withdraw from the market, and fees and investment were also regulated to protect consumer benefits against excessive monopolies. These are indicated in Figure 2.1.



- D : Demand
- AC : Average cost
- Q : Production volume
- P : Fees
- MC : Marginal cost
- MR : Marginal proceeds

Figure 2.1: Markets Characterized by Natural Monopoly

As indicated by Figure 2.1, Q diminishes AC , indicating the emergence of economies of scale. This applies to all industries in which $D <$ fixed costs. In such cases, the most efficient supply system is monopoly by a single enterprise. Realization of Q_{mc} , at which $P = MC$, will constitute Pareto efficiency.

If a company sets P at its own discretion in a market characterized by natural monopoly, P will satisfy the expression “ $MR = MC$,” provided that the company intends to maximize profits.

Therefore, under the same provision, P will equal $P_{mc} \rightarrow P_m$ and Q will equal $Q_{mc} \rightarrow Q_m$. This generates a “dead load,” which indicates that natural monopoly has failed to efficiently allocate resources, and which could lead to market failure. The first step in preventing this will be to impose regulations on P and project approval, and streamline the market.

However, this streamlining is based on the premise that supplies are sustainable, and differs from the concept of the market in a real sense. According to Figure 2.1, $P = P_{mc}$ will be favorable to consumers, but will create a huge deficit for suppliers; consequently, the suppliers will not be able to stay in business. When $P = P_{mc}$, it is called the MC fee.

When P equals P_{ac} , it is called the AC fee, and it will only be favorable to consumers if suppliers maintain earlier levels of profits and expenses. To use fixed-line telephones as an example, basic charges will be based on fixed costs, and specific charges, which will be imposed on consumers for their actual use of the service, will be derived from MC , depending on individual suppliers. In such a scenario, suppliers will not suffer any deficit.

In the 1960s, all US public industries, including the electricity, airlines, and telecommunications industries, were becoming increasingly inefficient, and doubts were raised concerning the existing regulations in these industries¹⁰.

Contestability theory as advocated by Baumol, Panzar, and Willig was aimed at relating these regulations to the characteristics of the public industries in order to theorize them. In the contestable markets on which this theory is based, suppliers have the following characteristics.

First, they are released from sunk costs and free to enter or withdraw from the markets, and to maintain similar cost and demand functions. Second, existing market players will revise the charges imposed on newcomers after a certain time lag.

In particular, since potential market entrants constantly monitor the excess profits of existing market enterprises, these enterprises cannot realize the profits and have no choice but to set AC fees at maximum levels in the aforementioned pricing procedure. If they succeed in generating an excessive amount of profit, new market players are able to enter the market abruptly, and withdraw from it before being counterattacked by existing enterprises. But what impact did this contestability have on the telecommunications industry? 2.3 Contestable Markets and Natural Monopoly

Contestability theory is based on the concept of contestable markets. It argues that resources can be efficiently allocated in a contestable market even if the market is in the state of natural monopoly.

According to this argument, natural monopoly generates the lowest possible fees, even though a single company controls the market. In this case, the entries of new market players will only lead to the division of production volume and increase total cost. In other words, the subadditivity of costs establishes the existence of natural monopoly.

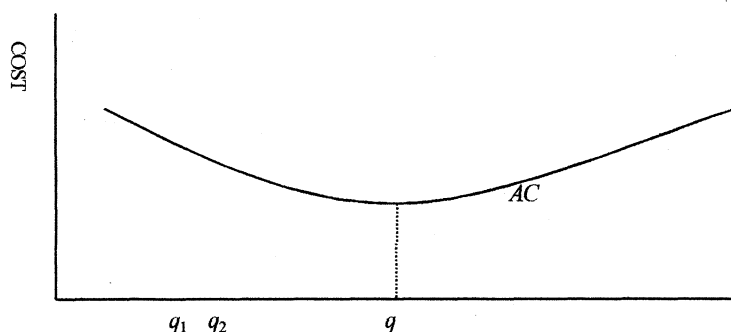
Subadditivity in the market is ordinarily proven by establishing equation (1).

$$C\left(\sum_{i=1}^n q_i\right) < \sum_{i=1}^n C(q_i) \quad (1)$$

C : Cost

q_1 : Production volume

It may be necessary to explain how subadditivity relates to economies of scale. Economies of scale are frequently confused with natural monopoly, so an explanation of how the two compare in terms of subadditivity of cost is necessary in order to correctly comprehend the latter. The explanation is as follows, with Figure 2.2:



AC : Average cost

Q : Production volume

q_1 : Arbitrary production volume ($0 < q_1 < Q$)

q_2 : Arbitrary production volume ($q_1 < q_2 < Q$)

Figure 2.2: Economies of Scale

On the AC curve, economies of scale occur between zero and q . If q_1 and q_2 are between zero and q , they will establish equation (2).

$$C(q_1)/q_1 > C(q_2)/q_2 \quad (2)$$

Here, q is divided into two components, as expressed in equation (3).

$$q = q_a + q_b \quad (3)$$

Since q_a and q_b are set between zero and q , the two following equations are established.

$$C(q)/q < C(q_a)/q_a \quad (4)$$

$$C(q)/q < C(q_b)/q_b \quad (5)$$

Equations (4) and (5) are multiplied by q_a and q_b .

$$(q_a/q)C(q) < C(q_a)q_a \quad (6)$$

$$(q_b/q)C(q) < C(q_b)q_b \quad (7)$$

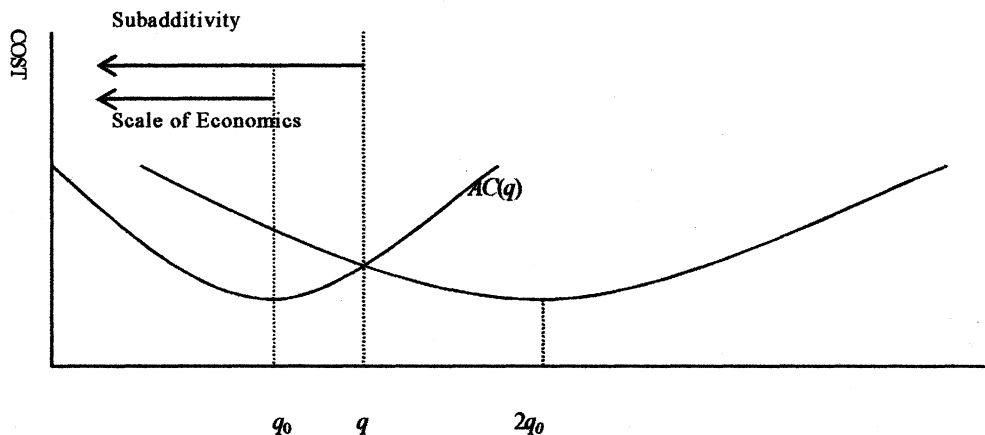
$$C(q) < C(q_a) + C(q_b) \quad (8)$$

As equation (8) demonstrates, if economies of scale exist, subadditivity of cost, which is established in equation (9), will materialize.

$$C\left(\sum_{i=1}^n q_i\right) < \sum_{i=1}^n C(q_i) \quad (9)$$

Since subadditivity of cost equals natural monopoly, natural monopoly will also eventuate in this market.

However, if economies of scale do not exist, will subadditivity of cost? Figure 2.3 shows the AC curves for cases in which there are only one or two players in the market, respectively.



$AC(q)$: Average cost of production volume

q : Arbitrary production volume

q_0 : Arbitrary production volume ($q_0 < q$)

$2q_0$: Arbitrary production volume

Figure 2.3: Subadditivity of Cost and Economies of Scale

Calculation of the cost of $AC(q)$ for q is as indicated by equation (10):

$$q \cdot AC(q) \tag{10}$$

If two companies are engaged in the production of q and each company produces half of the total volume of production, their costs will be as indicated by equation (11):

$$1/2q \cdot AC(1/2q) \cdot 2 \tag{11}$$

Therefore, AC is indicated by equation (12):

$$AC(1/2q) \tag{12}$$

The AC curve for equation (12) is produced by doubling the value of $AC(q)$ on the x-axis, as shown in Figure 2.3.

As shown herein, economies of scale occur at all points where $AC(q)$ slopes downward. But at which part of the curve is subadditivity established?

When there are only one or two companies, the portions of the AC curves for

equation (12) where subadditivity takes place are the sections where the AC of the former case does not exceed that of the latter. This would establish equation (13):

$$AC(q) < AC(1/2q) \quad (13)$$

As indicated by equation (13), the range where natural monopoly is established is not identical to the range where economies of scale are established. Wherever economies of scale occur, so does subadditivity of cost. This means that economies of scale create natural monopoly, but not vice versa.

We also need to examine the cost function in cases where two or more types of services are provided simultaneously after a single service (q) has been provided. In the field of telecommunications, for example, the Nippon Telegraph and Telephone Public Corporation (NTT) was concurrently offering fixed telephone (q_1) and wireless phone (q_2) services. This situation is expressed in equations (14) and (15).

$$C(q) \quad (14)$$

$$C(q_1, q_2) \quad (15)$$

These are known as cost functions. Is subadditivity of cost present in such cases and, provided that Nippon Telegraph and Telephone Public Corporation offers q_1 and q_2 , what style of management will realize the most efficient total cost? In order to ascertain this, I will divide service volume into the proportions α and β , and compare the costs the service incurs before and after the division.

If the cost incurred after the division is larger, this telecommunications service features subadditivity of cost, as established in equation (16), and therefore possesses economies of scope.

$$C(q_1, q_2) < C(\alpha q_1, \beta q_2) + C[(1-\alpha)q_1, (1-\beta)q_2] \quad (16)$$

q_1 : Supply of certain products and services

q_2 : Supply of certain products and services

α : Proportion of q_1 in supply

β : Proportion of q_2 in supply

If $\alpha = 1$ and $\beta = 0$, they will realize equation (17):

$$C(q_1, q_2) < C(q_1, 0) + C(0, q_2) \quad (17)$$

Since subadditivity of cost and economies of scope have been established, natural

monopoly is acceptable.

2.4 Examination of Natural Monopoly in the Field of Telecommunications through Subadditivity of Cost

Does natural monopoly exist in the field of telecommunications? If it is established that subadditivity of cost exists in the field of telecommunications, natural monopoly will be deemed acceptable and market competition denied.

In the fixed telephone sector of the US telecommunications industry, the denial of subadditivity of cost and, subsequently, natural monopoly was triggered by the separation of AT&T, which offered local and long-distance phone call services and will be referred to herein. D. S. Evans and J. J. Heckman referred to the breakup of AT&T and examined natural monopoly and subadditivity of cost in the field of telecommunications.

Evans and Heckman examined subadditivity through estimation of the cost function. According to them, the detection of the division ratio, which showed that AT&T's total cost was smaller before the separation than it was after, would prove that the cost was not minimized, subadditivity of cost was dismissed, and natural monopoly was denied. Therefore, the separation was acceptable because it enhanced social benefits¹¹. At that time, however, three companies (AT&T [Bell], MCI Communications Corporation, and Sprint) had already entered the long-distance communication market, and it is doubtful that the work of Evans and Heckman had much economic impact.

Evans and Heckman's work was used to support the vertical separation of AT&T. The three aforementioned companies were already players in the long-distance communication sector, and the market was thought to be contestable. As a result, Evans and Heckman did not find evidence of a natural monopoly, and this supports vertical separation.

However, Cooper and Sueyoshi later opposed it in their examination by using Operations Research¹². These argumentations then developed into a discussion of how cost function should be defined. Since the calculation of cost function, which is a precondition for the examination, has yet to be determined, quantitative analyses on natural monopoly are difficult to conduct. These would provide a basis for the separation of AT&T in terms of subadditivity of cost.

2.5 Criticisms of Contestability Theory and their Modern Significance

There are problems concerning the way contestability theory has been applied to the separation of AT&T and liberalization of telecommunications. In case a market fails, the regulations, if implemented, are aimed at allocating resources efficiently and minimizing

costs. If these goals are achieved through natural monopoly, competition may not be necessary. This notion emphasizes the minimization of cost.

But if the market is contestable, regulations are not necessary, and the market does not need to consist of more than one company. From the 1970s through to the 1980s, contestability theory was a popular theoretical basis for deregulation and liberalization. Its details are beyond the scope of this paper, since they are discussed by other researchers, but it is widely known that the liberalization of the US airline industry, which is a network industry, was based on the concept of contestability.

In the end, contestability theory failed to confirm the assumption that there are no sunk costs. It became clear that it would be impossible to recover the cost of business operations using leased or used aircraft in order to facilitate withdrawal from the market, and contestability theory was dismissed.

The theory is obviously weak, and its effectiveness has already been lost. In spite of its lack of theoretical strength, however, it possesses aspects that serve as a useful reference for the present-day deregulation of telecommunications. For one thing, although its presentation of sunk costs as an illusory element is not reliable per se, this notion indicates that the division of cost structure is possible through ownership classification, use rights, and the like. The traditional concept of fixed equipment integrates ownership and business use; therefore, in traditional telecommunications businesses, regulations have been justified on the bases of economies of scale or economies of scope.

With regard to equipment-dependent industrial organizations, including network industries, contestability theory suggested the possibility of separating the cost structure by dividing ownership and equipment use rights. In addition, as IDA states, the creation of a contestable market would eliminate the need to regulate public businesses. This is an important point.

In other words, since regulations for public businesses are based on the concept of natural monopoly and aimed at controlling corporate activities, a contestable market provides no bases for regulations because they are no longer needed. Consequently, IDA referred to this theory as a dynamic industrial policy and evaluated it positively for its unique approach to market structure.

Contestability theory was not designed to address the need for structural separation in the present-day telecommunications sector. However, as mentioned below, competition for subscribers was important in the heyday of the Internet Protocol Suite (TCP/IP), and the combination of the broadcasting and telecommunications industries may result in the creation of a new industry. The business structure of this new industry has recently become a major policy issue, although it is not addressed herein; but for the aforementioned industrial spheres, contestability theory suggests a useful way of grasping structural separation.

Amid the technological innovations achieved in the fields of information and

communication, present-day network industries, especially the telecommunications and broadcasting industries, are under pressure to review their industrial organizations. In addition to addressing the issue of ownership and use of equipment, contestability theory provides a basis for the possible separation of equipment structure.

Contestability theory provides a similar competitive structure to that realized by the classification of equipment in access areas in accordance with unbundling regulation. However, as IDA states, contestability theory does not necessarily provide theoretical grounds for unbundling.

3. Economic Effects of Unbundling Regulation

3.1 Unbundling in Telecommunications

According to contestability theory, sunk costs in traditional telecommunications correspond to exclusivity in local communication networks. However, this argument has never been clarified. As observed herein, it was influenced by political interests, which resulted in the privatization and separation of existing businesses by sector, and the division of core networks into long-distance and local systems. Since economies of scale were based on the exclusivity of local networks, they could not be achieved by suppliers during the heyday of TCP/IP. Therefore, regulations on public businesses grew less and less necessary, and the opportunity to apply contestability theory was lost.

The type of broadband examined herein is the network that constitutes the access areas consumers use in order to enjoy Internet services. It differs from traditional telecommunications in terms of importance. Broadband provided through alternative technologies, such as the digital subscriber line (DSL), cable television (CATV), and fiber to the home (FTTH) technologies, does not necessarily satisfy the conditions for sunk costs, so it cannot be analyzed using contestability theory. Further, the access areas, which formed a huge obstacle to entering the traditional telecommunications market, were opened up in the TCP/IP period, when the industrial structure that had monopolized these areas was transformed.

Because of widespread Internet use, competition policies for telecommunications have changed, and the Ministry of Internal Affairs and Communications announced the New Competition Promotion Program 2010 in September 2006. This is a road map to lay down appropriate competition rules by 2010. The effectiveness of unbundling in the access areas will be judged by relevant demand and supply substitutions and studied in relation to the following conditions, which were suggested by J. A. Hausman and J. G. Sidak¹³.

Condition ① : Business A offers telecommunications services not only to Business B, but

also to consumers.

Condition ② : Business B offers telecommunication services to consumers by using related services provided by Business A.

(1) Business A can unbundle its network and provide Business B with technological connections.

(2) Business A refuses to unbundle the network connections at a competitive or regulated service charge.

(3) Business B is unable to construct its own network at a reasonable cost.

(4) Business A monopolizes the network in order to provide services to consumers.

(5) Business A dominates the market by refusing to provide Business B with the network connections.

According to Ida, conditions (1) to (4) are requisites to prevent competition, but not sufficient conditions. However, condition (5) is necessary and sufficient, and materializes if the profits of existing businesses increase through Small but Significant and Non-transitory Increases in Price (SSNIPs), as stipulated in the guidelines for mergers in 1992. If existing businesses implement SSNIPs and consumers switch to other services, the businesses will lose profits and SSNIPs will be avoided. As a result, the absolute dominance of existing businesses will be diminished.

3.2 The Effects of Unbundling Regulations on ADSL Services

This section examines the field of ADSL services. NTT East and West possess the network equipment necessary to attract subscribers and the dominant player in the market. Assuming that they provide ADSL services, what kinds of regulations will be required?

NTT East and West correspond to Hausman and Sidak's Business A, and are capable of operating and offering ADSL service independently, and providing Business B with the network equipment for subscribers. Business B is a type two carrier that does not possess the network for subscribers. If the network equipment belonging to NTT East and West satisfies the aforementioned conditions (1), (2), (3), and (4), the equipment will be absolutely necessary for a type two carrier that intends to provide ADSL services, and constitute a necessary and sufficient condition for the implementation of regulations. However, electricity-related businesses possess their own equipment, so they will not require NTT's equipment.

As indicated by this example, regulations imposed on equipment vary depending on individual businesses, and NTT's ability to dominate must be examined in order to found rules for the application of unbundling regulations on ADSL businesses. Suppose that NTT East and West set high charges for type two carriers to obtain a connection to

the network equipment for ADSL subscribers (such as fees for connection costs). The demand for ADSL services provided by type two carriers would decrease and the demand for services provided by NTT East and West would increase, resulting in an increase in profit for NTT East and West. In this case, the network equipment of NTT East and West (an existing business) for subscribers reduces demand for the services of other type two carriers, and increases the profits of NTT East and West. This is why, in the ADSL market, NTT East and West were obligated by unbundling regulation to open up their network equipment for subscribers, and to do so in accordance with regulations based on SSNIP.

The New Competition Promotion Program 2010 anticipates that telecommunications and broadcasting businesses with a horizontal industrial structure will become increasingly integrated, while those with the traditional service-providing structure in the layer structure classification will become progressively unclear, and are likely to undergo vertical integration. The aforementioned program addresses four core issues, of which the proper balance of equipment and service competition is related hereto. As mentioned above, the supply of broadband is divided into two categories: one in which the provider offers services with self-constructed facilities (equipment competition), the other in which the provider depends on other existing businesses for access equipment in order to offer services (service competition). Striking a balance between these two types of competition is an important matter.

ADSL services have rapidly expanded among consumers due to service competition, which has been facilitated by unbundling regulation, and through utilization of the networks owned by existing businesses (NTT). Equipment investment by NTT East and West has also influenced the competition for the provision of FTTH services, the uptake of which shows an increase in the number of urban subscribers. That is, the balance between equipment and service competition also has a huge impact on competition in this sector. For example, equipment competition is effective in densely populated areas such as the national capital, but difficult and unlikely to succeed. In sparsely populated areas, where service competition is the only choice. However, investment efficiency in service competition is low for existing businesses, which makes it difficult to obligate them to open up the access areas of their optical fiber networks in a uniform way.

3.3 Model of Market Analysis Based on SSNIP

This section examines the model of market analysis created by Hausman, G. Leonard, and C. Velluro,¹⁴ and the version adapted by Ida from that model¹⁵, and applies them to the ADSL market. The existing business, Business A, is a verticalized telecommunications carrier that allows type two carriers to use its equipment and

provides direct services to consumers, and its market shall be referred to as the consumers market. The newcomer, Business B, is a vertically separated type two carrier and uses Business A's equipment to provide consumers with services, and its market shall be referred to as the B market.

According to Hausman's model, if Business A excludes profits obtained from the consumer market (that is, if it only provides services to Business B), the critical market share at which its profits become equal before and after its charges are increased due to SSNIP is shown in expression (18):

$$\mathcal{G} \geq \frac{1 + \eta_B [(1 + \alpha) - M^U]}{(\eta_B - \eta_A) [(1 + \alpha) - M^U]} \quad (18)$$

θ : Business A's share of the consumers market
 α : Rate of fee increase in accordance with SSNIP

M^U : Business A's ratio of marginal cost to fee in the B Market

η_A : Elasticity of demand for Business A' services

η_B : Elasticity of demand for Business B' services

If the expressions $M^U = 0.5$, $M^D = 0.5$, $\alpha = 0.05$, $\eta_A = -0.5$, $\eta_B = -5$ are substituted in equation (18), $\mathcal{G} \geq 0.707$. According to Ida's model, this means that if Business A's market share exceeds 70.7%, it can increase its profits through raising its fees by 5%. On the contrary, if Business A's market share does not exceed 70.7%, it cannot increase its profits by raising its fees by 5%.

Ida further developed expression (18) and deduced the market power of existing Business A (a "verticalized company") in the consumer market. \mathcal{G}^* is Business A's critical market share when its profits in both the B Market and the Consumer Market are included, and is calculated with expression (19):

$$\mathcal{G}^* \geq \frac{1 + \eta_B [(1 + \alpha) - M^U]}{[(1 + \alpha) - M^U] (\eta_B - \eta_A) - \left(\frac{1}{M^D} - 1\right) [1 + (1 + \alpha) - \eta_B]} \quad (19)$$

According to Ida, M^D is Business A's ratio of marginal service cost to fee, and if Business A's share of the consumer market exceeds \mathcal{G}^* , it can increase total profits by raising its fees. In this case, Business A is the dominant player in the market. If Business

A increases its profits by raising fees, $\mathcal{G} \geq \mathcal{G}^*$, and the critical market share of a verticalized company will be smaller than that of a vertically separated company. In other words, Business A, a verticalized company, will be able to reduce critical market share by raising its fees and, therefore, its profits from the B and consumer markets, and will be more likely to exercise its market power¹⁶.

Hausman and Sidak's five items, which are mentioned above, make it theoretically possible to propose this kind of examination, although the usefulness of this theory has not yet been confirmed. Nevertheless, it can be said that the integration of the broadcasting and telecommunications industries has exemplified the possibility of separating businesses either horizontally or vertically, including the option of dividing equipment structures through unbundling regulation, which was suggested by contestability theory. This possibility has stimulated competition in the ADSL market and encouraged the spread of broadband.

4. Conclusion

This paper has examined the economic roles played by public business regulations in traditional telecommunications. It has based its analysis on the revision of the Telecommunications Business Act, which has encouraged the spread of broadband via a competitive system that does not rely on such regulations.

Through this examination, I have tried to prove that traditional business regulations based on theories involving economies of scale and natural monopoly are not applicable to the promotion of broadband. In addition to reviewing theories related to public business regulations before and after the liberalization of telecommunications, have also studied these theories for grounds related to the promotion of Broadband. Although the economic effectiveness of contestability theory has yet to be ascertained, its notion of separating the ownership and use rights of equipment structure should be reevaluated for present-day significance because it may provide clues to the issue of unbundling regulation.

References

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¹⁶*Ibid.*, According to Ida Model, In Case, $M^U=0.5, M^D=0.5, \alpha=0.05, \eta_A=-0.5, \eta_B=-5, \theta \geq 0.593$. Therefore, if market share of player A in consumer market is more than 59.3%, player A can increase 5% of the profit, player A can be dominant player in the market. At the time, access charge of player A in consumer market of player B should be regulated to be less than present level. But if market share of player A is less than 59.3%, player A can't increase its profit to rise 5% up of fee (can't be dominant), at the time, it is possible to deregulate the customer fee of player A in the market of player B.