Determinants of Profit in the Broadcasting Industry

― Evidence from Japanese Micro Data―

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【Summary】

The operating areas of each terrestrial broadcasting station in Japan are geographically divided by a licensing system and form oligopolies in each of their respective markets. These institutional constraints define the market structure, and as a result, affect the business performance of the broadcasting industry. The primary purpose for regulation is based on the "Media Ownership Rule," a rule designed for preserving "plurality," "diversity" and "localism" of stations. Similar rules exist in many countries, but benchmarks differ. To this end, if the regulative authority introduced a new regulation framework, it might be useful to improve the financial foundation of the licensed stations, thus preserving the original purpose of the rule. With the rapid progress of digital technology and the increasingly diversified selection of media types, the government needs to urgently review Japan's old regulations with the aim of giving more freedom in the operation of terrestrial stations and so promote voluntary restructuring.

Based on the above viewpoints, we implemented an econometric analysis with respect to factors that affect on the business performance (especially on profit) of each station. We focus on the terrestrial broadcasting industry because it plays a central role in the Japanese broadcasting system. As a result, we ascertained the following points.

(1) Structural parameters: market share of each station has a positive correlation with profit, although market concentration appears to have no correlation.

(2) Geographical parameters: the number of households per station and the income per household have positive correlations.

(3) Business parameters: the aired ratio of self-produced TV programs has a positive correlation with revenue, although it has a negative correlation with profit.

It is said that geographical environment is quite important for business performance in the broadcasting industry. This hypothesis is strongly supported by our results. Therefore deregulation and subsequent voluntary rearrangement may reinforce the operating basis of each station.

Keywords: Terrestrial Broadcasting Station, Determinants of profit, Principle of Media Ownership Rule, Audience Share, Oligopoly

(*JEL* Classifications: D43, L13, L82)

1. Background

Recently, it has been said that the business performance of terrestrial broadcasting stations will deteriorate in the near future with the coming drastic change in the business environment. In accord with these misgivings, the regulating authority (the Ministry of Public Management, Home Affairs, Posts and Telecommunications, hereinafter referred to as "MPHPT") has reviewed the "Media Ownership Rule[1]" (hereinafter referred to as "MOR")[2]. The MOR was originally designed to preserve "plurality," "diversity" and "localism" of the stations[3]. It regulates the geographical operating areas of stations; basically following prefectural boundaries as administrative units, and restricts the number of holding or controlling stations as one regulative principle[4]. Therefore, it can be said that the MOR and related regulation creates an oligopoly in each of the terrestrial broadcasting markets. Such framework of regulation on the basis of the operating area and the accumulation of station ownership hadn't been changed at of this time review. On the other hand, the report also pointed out the necessity of discussion and examination in respect to the introduction of other benchmarks such as the number of households or audience share. These kinds of measures might be useful to improve the financial bases of the stations.

The traditional SCP hypothesis is that profit in the broadcasting industry comes from performance (P) in the market induced from market structure (S) and market conduct (C). In this sense, profits are the direct indicators of stable operating foundations for stations. Therefore, in this paper, with respect to terrestrial broadcasting stations, which play a central role in the Japanese broadcasting industry, we empirically estimate the various

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1 The rule for regulating acquisitions or mergers between terrestrial stations forces stations to in principle operate within one prefecture, except for Tokyo, Osaka and the Aichi metropolitan areas. It also restricts the upper limit of the capital ratio: for a broadcasting station within the same service area, one-tenth of voting rights or less, whereas for a broadcasting station within a different service area, less than one-fifth of voting rights. Like this, it has prevented certain stations from having influential power in the mass communication field.

2 The report issued by the MPHPT (February, 2003) set out their policy that the MPHPT deregulate the MOR and allow mergers of two adjunct local stations, or the operation of a bankrupt station as a subsidiary. As we can see in their report, the MPHPT expects efficient operation and reinforcement of operating foundations, subsequent reservation of high-quality content, and smooth transition to digital broadcasting services by deregulation of the MOR. Especially the MPHPT looks at drastic deregulation of local stations with some conditions because their business performance might be worsened in the near future.

3 Originally the MOR was designed with two principles: one is the restriction of the number of stations considering the scarcity of frequency; the other is the decentralization of social influence through TV programming.

4 As an exception, one company is allowed to operate both a middle-wave radio station and a TV station in the same area.

(structural, geographical and business) factors affecting profit; thereby, examining effective institutional factors to enhance operating foundations.

The structure of our paper is as follows. In section 2, we survey previous research. In section 3, we briefly review the economic features of the terrestrial broadcasting industry. In section 4, we explain our base model for estimation. In section 5, we examine the estimation results、 and in section 6 we overview the current business environment for each station. Finally, we summarize our results and state the political implications of this paper.

2. Previous Empirical Studies on Television Station Profitability

In discussing their economic analysis of the Japanese broadcasting industry, Takeuchi (1993), Mitsufuji (1995) and Yasuda (2000) used station-based data and focused on the determinants of profit / revenue.

Using the JNN network data, Takeuchi (1993) classified station revenue as main office revenue / branch revenue / key station revenue[5] and showed that the "sum of branch and key station revenue of each station" has a significant positive correlation with the number of households and GRP (Gross Rating Point). He also showed that the "sum of station revenue in a certain prefecture" has a negative correlation with "the number of stations in that prefecture." There are five major networks in Japan and it is well known that the key station in each network has to subsidize local stations to maintain a national broadcasting service. Thus, any reduction of revenue per station must be subsidized by the key station in the above situation. Based on this result, he pointed out that the power of a key station towards a local station will be enhanced if many terrestrial stations are set up.

Mitsufuji (1995) analyzed the effect of the entry of a new station on the operating revenue of an incumbent TV station. After regressing the sum of total operating revenue on GRP in a certain prefecture, he found that operating revenue is highly dependant on past revenue, and the entry of a new station increased revenue in that market by around 2

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5 The word "branch revenue" means revenue from branch located in key station area or in quasi-key station area, whereas "key station revenue" means distributed revenue from key station (key station signs up for advertisement as a representative of network). It is said that the revenue ratio from main office / branch / key station is around 2:5:3. Of course it is favorable to analyze based on each kind of revenue respectively, but we couldn't get revenue ratio data. It is remain to be solved in future.

billion yen. Yasuda (2000), using network based data, regressed annual ordinary revenue on an average network dependent rate, annual sales, previous ordinary revenue, nominal GDP (Gross Domestic Product) etc. and found that the higher the average network dependent rate, the greater the ordinary profit.

In the United States, on the other hand, analyses on determinants of revenue / profit have been implemented since '70. The reasons being: (1) The FCC (Federal Communications Commission) decided on a policy of licensing an increased number of broadcasting station, and so stimulated an open discussion, and (2) cable TV had become widely used and advertising using cable TV's basic channels began to increase around that period. Greenberg (1969) provide one of the early analyses. He used 1960-62 data and showed that the profit of a station is positively correlated with audience size, network affiliation, and number of stations in the market. He also analyzed the cost advantage of UHF (Ultra High Frequency) / VHF (Very High Frequency) for to discuss whether the FCC's licensing policy was correct or not; though no clear result emerged.

We can see that Greenberg's success largely depends on his finding that revenue / profit is strongly correlated with number of households per station. After Greenberg's paper, much research was implemented using this environmental variable. Webbink (1973) analyzed the relationship with a new entry into the area of an existing station. Besen (1976) considered the relationship with the price of advertising. On the other hand, Fisher et al. (1980) researched the relationship with advertisement revenue and subsidy from an affiliated network, using actual audience data as a replacement for a potential audience (=number of household). Although Fournier (1986)'s primary purpose was to measure the impact of VHF/UHF on business performance and to analyze the FCC's licensing policy, his estimate equations had similar structures to the above research. Fournier tried to refine previous research by clarifying the definitions of "market" and "profit."

More recent empirical research includes that by Ekelund et al. (2000a) and Ekelund et al. (2000b). The former empirically examined the relationship between market concentration and profit in the U.S. radio market, while the latter analyzes the relationship between each terrestrial broadcasting market based on advertising revenue. We refer to these reports again in section 5.

In the following section, we analyze the relationship between revenue / profit and the business environment surrounding the broadcasting industry in Japan, referring to previous research carried out in the United States.

3. The Characteristics of Terrestrial Broadcasting Industry

To clarify our hypothesis through empirical research, we take a brief look at the economic features of the revenue/cost/market structure of a broadcasting station.

3.1. Cost Structure

The operating cost of a broadcasting station can primarily be classified as content procurement costs and transmission costs. This cost structure is somewhat different between a key and a local station. In essence, production costs are higher for a key station while transmission costs are higher for a local station.

Because TV programming is an important input for determining the value of the advertisement service, broadcasting stations must prepare popular programs if they are to earn a profit. However, because program production is labor intensive, and needs a large initial cost but less marginal re-production cost, there exits strong economy of scale in the process of program production. Therefore, it is quite important for a station to avoid or to decentralize this cost burden, or it must efficiently recover its cost. From this aspect, we can regard the current network affiliation system as a method to decentralize cost burdens to achieve the production of popular TV programs[6]. In short, a key station is in charge of purchasing content or acquiring advertising revenue as a representative of its affiliated stations; on the other hand, affiliated local stations serve as a means of distributing TV programs and advertisements. Conversely, in respect to local TV programs, these bear a heavy cost burden for each station because it is difficult to decentralize their costs.

Transmission cost primarily consists of two kinds: (1) maintenance and management costs for the intermediary station used for transmitting the station signal, and (2) Costs for using micro wave links provided by telecommunications carriers, to distribute programs to local stations. The equipment used in a broadcasting service are mainly

6 Although the 127 broadcasting stations in Japan are legally individual enterprises, most stations affiliate with the five major networks (NNN, JNN, FNS, ANN and TXN). Even in the case that stations are not affiliate with a network, these scales are quite small. In an actual market, the network affiliation system is allowed for the purpose of joint sales or joint production of TV programs, nevertheless MOR exists. So affiliated stations tend to depend on key stations for know-how on program production or advertisement sales. Capital relationships are also very complex.

one-way radio transmitters, which are suitable for distribution over a wide area. Therefore, it can be said that transmission costs tend to be digressive as target household density increases[7].

3.2. Revenue Structure

Terrestrial broadcasting stations obtain revenue primarily from advertising; this revenue is classified as "time" or "spot," and is further classified as "for national" "for local"[8]

Revenue from time advertisements is proportional to the station cost because production and airwave costs for providing TV programs are basically financed by the revenue from advertising. On the other hand, the price for spot advertisements is determined based on the "cumulative audience rate" and "reach cost per thousand people," so advertising revenue is affected by audience rate and the number of households in each operating area. Because advertising time is restricted, it is reasonable to consider that demand and supply are adjusted through the advertising prices. Therefore, the profit of each station depends largely on revenue from spot advertisement.

Considering the classifications of "for national" / "for local," it can be seen that advertisement services are geographically differentiated. Therefore, it is easy to assume that the price for an advertisement is affected by structural parameters (audience (market) share) and geographical parameters (The number of households per station, and income per household)[9].

3.3. Market Structure

Each broadcasting station provides CM (Commercial Message) time for advertisers as an opportunity to reach out to an audience. In this business model, the price for an advertisement functions as a signal for reflecting evaluation and/or outcomes in the

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[7] It is sometimes pointed out that the diminishing rate of costs in the broadcasting industry is not so large compared to other public utility enterprises, such as Gas, Water and Electricity. Refer to Chapter 3, Sugaya and Nakamura ed. (2000).

[8] "Time advertisement" means the sales method that commercial time is combined with a TV program (30min/60min). On the other hand, "spot advertisement" is televised during a "station break," which is set between programs (1min in principle).

[9] It is said that advertising revenue is a quadratic function of audience size, such that revenue increases at an accelerating pace with audience size. Refer to Mizuho Corporate Ginko (2002).

market. In addition, as a result of licensing system and entry regulation this terrestrial broadcasting market forms an oligopoly in each prefecture. Therefore, from the viewpoint of advertisers, services provided by stations are differentiated in two ways. In short, a broadcasting service is geographically differentiated (the number of operating stations / the number of households / income) in a certain market as well as differentiated even within the same market: (TV program, program scheduling, and audience share). This differentiated oligopoly structure is a quite unique feature of the broadcasting industry. Thus, thorough advertisement revenue, the above factors greatly affect the business performance of each broadcasting station.

In the following section, we derive our estimation equation based on these economic features within the broadcasting industry.

4. Profit Equation in Oligopoly Market

In this section, we derive our estimation equation based on the theoretical relationship between profit and the proxy variable of market concentration, considering the fact that the operating areas of each station form an oligopoly in the market[10].

At first, we assume that advertiser's demand for terrestrial broadcasting service is described by the following equation.

$$p = f(X) = j_0 X^{j_1} Z^{j_2} \tag{1}$$

X shows the sum of the output of each station ($X = \sum x_i$), whereas Z means the demographic indicators in each market. Average and marginal cost of the i th station is c_i and constant ($c_i \neq c_j, (i \neq j)$). Here, profit is shown by the following equation.

$$\pi_i = f(X)x_i - c_i x_i \tag{2}$$

Using the condition for profit maximization,

$$\frac{\partial \pi_i}{\partial x_i} = \frac{\partial f(X)}{\partial x_i} x_i + f(X) - c_i = 0$$

10 A similar oligopoly structure is found in the banking industry and several reports have been done on this in Japan. The following theory and derived equations depend largely on Iwane (1990).

Here, if we describe total output such as $X = x_i + X_{-i}$, separating the i th and the other stations, the above equations can be shown as follows.

$$\frac{\partial \pi_i}{\partial x_i} = \frac{df}{dX}(1+\lambda_i)x_i + f(X) - c_i = 0, \quad \lambda_i \equiv \frac{\partial X_{-i}}{\partial x_i}$$

If we assume a Cournot market, a market in which other station do not change their output when the i th station changes its output, and the conjectural variation, λ_i shows zero, we can get the following equation (3).

$$\frac{px_i - c_i x_i}{pX} = \left(\frac{x_i}{X}\right)^2 \left(-\frac{X/p}{dp/dX}\right) \tag{3}$$

Summing up all the individual stations, and setting the Herfindahl index as $HHI = X(x_i / X)^2$, the price elasticity of demand as η, the profit of the whole broadcasting industry can be shown as follows:

$$\pi = pXx_i - Xc_i x_i = HHI \cdot (1/\eta) pX$$

Substituting equation (1) into p and rearranging the equation, we get the following equation, which shows the profit level of a certain industry is closely related to the Herfindahl index.

$$\pi = HHI \cdot (j_0 j_1) X^{j_1+1} Z^{j_2}$$

In short, the profit level of all the industry is closely related to the HHI (Herfindahl Index), X (output of the whole industry) and Z (demographic variables). Because π in above equation is the profit of all the industry, we use an additional assumption that $MS_i = (\pi_i / \pi)^\alpha$ for further transformation of this profit equation with respect to an individual station. In other words, we assume that market share (MS_i) is equal to the profit ratio of an individual station to the total broadcasting industry. Substituting it into the above equation and using a natural log, we can obtain the following equation.

$$\ln \pi_i = a_o \ln c + a_1 \ln MS_i + a_2 \ln HHI + a_3 \ln X + a_4 \ln Z$$

Practically, we use $RATE_i$ (annual average audience share of each station) as a proxy of

MS_i (market share) and scale the variables of each station, $ASSET_i$ (total amount of gross asset of the i th station)[11] because the industrial output X is difficult to obtain directly. In addition, we introduce control variables to show geographical and business characteristics of each station. Finally, our estimation equation is shown as follows[12]:

$$\ln \pi_i = \ln \alpha_0 + \alpha_1 \ln RATE_i + \alpha_2 \ln HHI_{1i} + \alpha_3 \ln ASEET_i + \alpha_4 \ln(HH / N)_i + \alpha_5 \ln Z_i + \alpha_6 \ln SELF_i + e_i \qquad (4)$$

We use the following variables as the number of households per station, $(HH / N)_i$ and income per household, Y_i as "geographical parameters". In addition, we adopt an aired ratio of self-produced TV programs, $SELF_i$ [13] as "business parameters." Some of the explanatory variables, such as the number of households or audience share, are also used in other countries as a benchmark for judging the degree of concentration in MOR. We propose that we should examine the possibility of introducing these variables as a substitutable benchmark in the Japanese MOR[14].

To obtain a stationary data set, we took a natural log of each variable. We used various data with respect to terrestrial broadcasting stations for three years, from FY 1998 to FY 2000[15] [16]. Because we use panel data, the random/fixed effects are considered on

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11 We also use "tangible fixed asset" instead of "gross asset" in our estimation model. However we don't report them because these results are mostly similar to our already reported results.

12 "ln" means "natural logarithm."

13 We treat $SELF_i$ as a exogenous variable although it might be natural to be considered as a endogenous variable for each station. Because (1) each station cannot necessarily decide the aired-ratio by itself, and (2) it is difficult for new entry stations to procure self-produced TV programs because of the lack of production know-how. The regulation authority has a directed policy that "each station should broadcast self-produced TV programs for more than 10 % of the total hours," at the time of license renewal. However, there are few stations in practice that are able to comply with this guidance. Actually if we focus on stations excluding key/quasi-key/backbone stations, (1) only 25.7% (49/191 sample) of stations satisfy the guidance criteria and (2) there are only 11 traditional (began operation before 1969) stations that broadcast self-produced TV programs for more than 10% of the total hours over a three year period. These facts strongly support our treating $SELF_i$ as an exogenous variable.

14 As a benchmark of MOR, the number of potential households is adopted in the United States, the sum of the annual average audience share is adopted in Germany and the ratio of total national TV watching time in the United Kingdom. Refer to the final report of "Study Group on Broadcasting Policy (2003)."

15 Ms. Shiho Iwamoto, who also patiently consolidated all data, and Mr. Kentaro Yoshimura (Applied Research Institute, Inc) helped for data input and checking. We y appreciate greatly their help. With respect to financial data of stations, we refer to "Nihon Minkan Ho-so Nenkan" (edited by Nihon Minkan Ho-so Renmei, issued by Ko-ken syuppan) and "Tsu-shin Sangyo Jittai Cyo-sa Keieitai zaimu Cyo-sa" (implemented by Jo-ho Tsu-shin Seisakukyoku, MPHPT). With respect to audience share data, we used the annual average rate data of each station from Video Research Inc. With respect to demographic data, we referred to "Zenkoku

estimation. We express explanatory variables as x_i, and error terms as $e_i = \beta_i + \varepsilon_i$. If $\text{cov}(\beta_i, x_i) = 0$, we should adopt a random effect model to preserve consistency and efficiency. If $\text{cov}(\beta_i, x_i) \neq 0$, then we should adopt a fixed effect model. Suitable models are determined by the χ^2-based Wu-Hausman test.

$RATE_i$: annual average audience share of each station[17].

HHI_{1i} : Herfindahl index in the market where the i th station operates business (calculated based on audience share).

$(HH/N)_i$: the number of households per station in the market where the i th station operates its business[18].

Y_i : income per households in the market where i th station operates business.

$SELF_i$: capability for procurement of self-produced TV program by i th station[19].

$ASSET_i$: total amount of gross asset of i th station.

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5. Estimation Results

Descriptive statistics and the correlation matrix for each variable are shown in tables 1 and 2, whereas the estimation result is shown in table 3. With respect to the dependent variable, π_i, we primarily focus on operating profit (net base) because our model is

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Shicyo-son Yo-ran" (edited by Shicyo-son Jichi Kenkyu-kai, issued by Daiichi Ho-ki) and "Kenmin Keizai Keisan" (issued by Keizai Kenkyu-syo, Naikakufu). If the operating area includes several prefectures, we sum up demographic data in all areas. Nominal data are deflated. In addition, financial data are multiplied by a TV ratio if the station operates via both TV and radio.

[16] The reasons for choosing this period are: (1) it was the latest available data set for us to use, (2) we can use it as a pooled data set that has almost the same quality with no reservation, because there was only one new entry station (Tochigi TV (1999)) and the business performance of the terrestrial broadcasting industry was relatively stable during that period.

[17] We exclude some stations because of the lack of $RATE_i$ data. (1) independent UHF stations (# 13) which are exempt from statistics, (2) stations which retain the right to audience share data (# 8), (3) stations which don't have data before 2000 (#3).

18 Explanatory variables such as $(HH/N)_i$ and Y_i are also used in Fournier (1986).

[19] At first, we used "the aired-ratio of self-produced TV program" as $SELF_i$ like Uchiyama (1996) and Yasuda (2000). However, the correlation with $(HH/N)_i$ was high, and it might cause a multicolinearity problem. Instead, we use "the aired-ratio of self-produced TV program" multiplied by "the number of years since its foundation" as $SELF_i$. Although the correlation coefficient is still high (0.67), we confirm our results are robust through a further estimation from an equation: one is the case without $SELF_i$, the other is the case excluding the large metropolitan areas.

induced based directly on profit. In addition, we also estimate an equation with respect to operating revenue (gross base), R_i, for comparison. It has sometimes been pointed out that the cost minimization principle is not applicable in the broadcasting industry. If this hypothesis is correct, it means that cost has importance in respect to companies' behavior, and the suggested explanatory variables are directly connected with only revenue, not with profit (= revenue - cost).

The results are shown as equations (i) and (ii). In the Wu-Hausman test, random effects are adopted with respect to the profit equation, whereas fixed effects are adopted with respect to revenue equation. A fixed effect model shows that each station has a specific individual effect while a random effect model shows that each station has no individual effect. In other words, revenue seems to be stable each year, but if we include costs in the consideration, it appears unstable. Generally, a business practice exists where key stations distribute revenue between affiliated stations; in this way revenue is adjusted to some extent. Our test results might reflect this fact. Equation (ii) shows greater R^2 (and $Adjusted - R^2$) and has a high power for explanation, although the signs of the coefficient and the degree of significance are similar. We examine our results individually.

First, we look at the relationship between the explanatory variable $RATE_i$ and HHI_{1i}. The proxy of market share, $RATE_i$, is positively significant in both equations, whereas the proxy of the coefficient of market concentration, HHI_{1i}, is significant only in equation (ii). Because our model directly shows the relationship between profit and $RATE_i$, or HHI_{1i}, we emphasize the result of equation (i). This means that the general hypothesis, "the higher the coefficient of market concentration, the higher the profit," would not be supported. This is consistent with Ekelund et al. (2000a), in which the relationship between market concentration and profit in U.S. radio market is empirically examined[20]. To avoid the multicolinearlity problem, we also estimate $RATE_i$ and HHI_{1i} separately as (i)' and (i)"; our findings still holds. Ekelund et al. (2000b) analyzes the relationship between each terrestrial broadcasting market and points out that advertisement revenue tends to shift to another markets with an increase of the advertisement price in one market. The same mechanism would also be applicable in the Japanese market. This is a future issue for discussion.

Next, we take a brief look at the estimation results for $(HH / N)_i$ and Y_i. If there is no entry barrier in the market and perfect competition is realized, a new station will enter a

[20] In this paper, we focus our analysis only on the terrestrial broadcasting station as a media for advertisement. how to treat the effect from another media (especially NHK) is still an unresolved issue.

market where $(HH/N)_i$ is larger, and finally the number of households per station will be equalized, and the degree of correlation with π_i will be lower. Contrarily, if there is certain entry barrier in the market, we expect a positive correlation with π_i because the economic rent is reflected. In respect to Y_i, we expect a positive correlation with π_i. For an advertiser, because it is a better strategy to advertise to households who have strong purchasing power, demand for advertisement in a market with a high household income will increase, and as a result, π_i will increase. Coefficients of $(HH/N)_i$ and Y_i show a significant positive sign. This shows π_i is larger if the number of households per station in the market is larger, and if income per household in the market is larger. MPHPT assesses applications for broadcasting licenses considering the economic situation in the relevant operating area. In that sense, our result showing that there is some room for π_i increased by $(HH/N)_i$ and increases in each market is consistent with our expectation. This is also consistent with the analysis shown in Fournier (1986).

The variable $SELF_i$, the aired ratio of self-produced TV programs by the i th station, shows a significant negative sign in equation (i) ((i)' & (i)") with respect to operating profit, whereas it shows a significant positive sign in equation (ii) with respect to operating revenue. From the viewpoint of revenue and profit, $SELF_i$ can be considered as the proxy for measuring the benefit from a network affiliation[21]. In other words, although the revenue of the station that must be procured its TV programs through a network (or they must be bought by another production company) is low, the station enjoys the benefits from its network affiliation if we consider the cost side. That is, the station whose TV programs are self-produced can acquire a larger amount of revenue, but it has to bear the corresponding cost burden. Therefore, the correlation sign is reversed if we estimate using an equation based on profit considering the cost side.

We also show another estimation result in equation (iii) (total sample 240), excluding large sized stations in three metropolitan area (Tokyo, Kansai and Cyu-kyo). Equation (iv) (total sample 189) shows the results excluding the three metropolitan area and other backbone stations (Stations in Hokkaido, Miyagi, Hiroshima and Fukuoka). Although R^2 (and $Adjusted-R^2$) and the explanation power of the whole equation decreases, our above analysis of each variable is almost the same. In addition, the multicolinearity problem with $SELF_i$ or $ASSET_i$ is drastically improved. Therefore, we can say our estimation results are quite robust.

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[21] Yasuda (2000) concluded that "the higher network dependent rate, the larger ordinary profit," using ordinary profit. Because ordinary profit is affected by cost, that result is consistent with ours.

From our analysis in this section, we see that the revenue and profit of each station tends to be equalized if market share, the number of households per station and income per household are equalized. Although market share is highly dependant on managerial effort by each station, the number of households per station and the income per household are exogenous variables, and can't be changed under current regulation. If we introduce new benchmarks as used in some other countries for reviewing MOR in Japan, it is possible to improve the financial foundation of stations, thus preserving the original purpose of that rule. Practically, the merger of two adjunct local stations will occur with the highest possibility. Even in that case, we propose that the regulatory authority should consider the environmental equality of each station.

6. Operating Revenue/Profit, the Number of Households per Station and Income per Household.

In the previous section, we confirmed that $\left(HH/N\right)_i$ and Y_i have a significantly positive effect on π_i; therefore, we can say these are also important variables for considering the operating foundations of each station. Indeed, there is previous research from the viewpoint of entry and profit of stations in the United States, such as Webbink(1973)[22]. In this section, we briefly take a look at the current business environment of each station in Japan.

Table 4 places, the business environments for stations in order based on $\left(HH/N\right)_i$ and Y_i in each fiscal year. We show two benchmark lines; one is the national average, the other is the average excluding three major-city areas. We can see that the order is quite different between the two benchmarks. As well, we show another rank based on the "combined index," which is calculated based on our estimated coefficient of $\left(HH/N\right)_i$ and Y_i.

Looking at the case of Tochigi prefecture. There was only one entry during our targeting period, 1998-2000. In the Tochigi market, there were five terrestrial stations in FY 1998 that provided service for an average 130 thousand households per station. But after the entry of Tochigi TV (individual UHF station) in FY 1999, the number of average households per station decreased to 110 thousand. Although $\left(HH/N\right)_i$ is lower compared to other markets, Y_i is larger than average. In that sense, Tochigi prefecture seems to be

[22] Webbink (1973) analyzed new entrant behavior of terrestrial broadcasting stations in the United States and concluded that new entrants have a significant positive correlation with the number of households per station in the market.

a promising market. If we use our "combined index," Tochigi is placed in a higher rank. Greenberg (1969) and Webbink (1973) primarily emphasized the effect from $(HH/N)_i$, Fournier(1983) pointed out that Y_i would be also important because it might show a "wealth effect." We can interpret the Tochigi case as an entry emphasized on Y_i from the viewpoint of business performance.

Each station can attract advertisers by providing popular content (=TV program) and obtaining high market share (=audience share). However, it is not easy if we consider the cost burden. It will be necessary to seriously consider the efficient operation of terrestrial broadcasting stations in the near future, especially in respect to mergers and acquisitions. It will be important for this to be discussed while considering the environmental factors.

7. Conclusions.

We summarize our estimation results again with respect to the determinant factors of revenue and profit[23]. .

(1) Structural parameters: Market share of each station has a positive correlation with profit although market concentration appears to have no correlation.

(2) Geographical parameters: The number of households per station and the income per household have a positive correlation.

(3) Business parameters: The aired ratio of self-produced TV programs has a positive correlation with revenue, although it has a negative correlation with profit.

As we demonstrated in section 5, our estimation results show the profit of a broadcasting station is strongly affected not only by structural parameters (audience share and market concentration), but also by geographical parameters (the number of households and income per households) and business parameters (aired ratio of self-produced TV programs). Considering the later two parameters are determined by exogenous regulation, we find implications for the current broadcasting policy. Especially, our results (1) and (2) imply that these kinds of benchmarks might be useful to improve the financial foundation of stations, thus preserving the original purpose of the MOR. In addition, as we saw in section 6, it is also important to use a combined index of these benchmarks. However, a stable operating foundation doesn't necessarily ensure the presentation of high-quality

[23]It is sometimes said, that from an institutional aspect there are great differences between the broadcasting industries of Japan and the United States. However, the results in this paper are consistent with our expectations, and are similar to those of previous research. We need to focus more attention on the fact that we could obtain these results even in the Japanese broadcasting market, which includes the public broadcaster, NHK.

content or a smooth transition to digital a broadcasting service; though we think it is at least a necessary condition. Our analysis in this paper shows there is the potential for a restructuring that will achieve a system suitable for the Japanese terrestrial broadcasting system.

After the so-called “bubble crash,” the Japanese economy has struggled with a severe recession, one that has been mentioned as being “the lost decade.” The broadcasting industry is not an exception. As well, digitalization is expected to drastically change the current network affiliation system. It also promotes competition in the advertising market and lowers the entry barrier. Under these circumstances, profits of terrestrial broadcasting stations might decrease drastically if the old regulations continue to be applied. Regulations restrict the behavior of the regulated firms regardless of the purpose of the regulation. Therefore, the current business environment might be improved if the MOR measures are reviewed; being ones which are regulated from the viewpoint of a social aspect rather than an economic one. This is one of the primary points that we make in this paper. With a purpose to promote voluntary restructuring of each station, efforts to review old regulations, will also increase the economic welfare of the audience. After designing institutional arrangements with respect to the terrestrial broadcasting industry, it might be possible to present a grand design for the whole broadcasting industry, including pay-TV and network distribution.

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Table1 Basic Statistics of Main Variable

variable		mean	standard deviation	minimum	maximum
dependent variable					
R	annual revenue of each station	20613020	507241	953966	318589400
lnR	(natural logarithm)	15.9447	1.0201	13.7684	19.5794
π	annual profit of each station	2167510	68901	2468	62498160
ln π	(natural logarithm)	13.3699	1.3393	7.8112	17.9507
independent variable					
RATE	annual average audience share of each station	7.8801	2.1519	2.2000	14.5000
lnRATE	(natural logarithm)	2.0212	0.3125	0.7885	2.6741
HHI_1	Herfindahl index calculated using RATE	0.2627	0.0444	0.2120	0.3573
$lnHHI_1$	(natural logarithm)	-1.3496	0.1584	-1.5512	-1.0292
HH/N	the number of households per station in the market where *i* th station operates business	405634.5	583915.2	92565.0	2637072.0
ln(HH/N)	(natural logarithm)	12.4195	0.8377	11.4357	14.7852
Y	income per households in the market where *i* th station operates business	10.3746	1.6062	7.2810	13.0832
lnY	(natural logarithm)	2.3270	0.1593	1.9853	2.5713
SELF	capability for procurement of self-produced TV program by each station	0.1093	0.1779	0.0019	0.9368
lnSELF	(natural logarithm)	-2.9161	1.1971	-6.2418	-0.0653
ASSET	total amount of gross asset of each station	24285760	603601	1024709	399340700
lnASSET	(natural logarithm)	16.1179	1.0382	13.8399	19.8053

282 samples equations(i)(ii)	240 samples equations (iii)(iv)					
	lnRATE	$\ln HHI_1$	ln(HH/N)	lnY	lnSELF	lnASSET
lnRATE	—	0.4842	-0.3118	0.1014	0.3529	0.1874
$\ln HHI_1$	0.4267	—	-0.2289	0.1990	0.0118	-0.1303
ln(HH/N)	-0.3169	-0.2291	—	-0.1693	0.3651	0.5269
lnY	-0.0542	0.0886	0.2352	—	0.0301	0.1353
lnSELF	0.1273	-0.0769	0.6738	0.2149	—	0.5406
lnASSET	-0.0032	-0.1868	0.8562	0.3354	0.7479	—

Table3 Estimation Results with respect to Determinants of Profit / Revenue

dependent variable	$\ln(\pi_i)$: Profit			$\ln(R_i)$: Revenue	$\ln(\pi_i)$	$\ln(\pi_i)$
	All Areas			All Areas	sample 240	sample 189
independent variable	OLS (i)	OLS (i)'	OLS (i)''	OLS (ii)	OLS (iii)	OLS (iv)
lnRATE	0.767 ***	0.618 ***	-	0.263 ***	0.815 ***	1.195 ***
	3.539	3.235		8.850	2.918	3.197
$\ln HHI_1$	-0.387	-	0.063	0.068 *	-0.280	-0.576
	-1.440		0.260	1.808	-0.922	-1.532
ln(HH/N)	1.046 ***	0.999 ***	0.715 ***	0.738 ***	1.288 ***	1.429 ***
	7.454	7.314	6.716	47.604	6.862	5.076
lnY	1.068 ***	0.954 ***	0.798 **	0.169 **	1.137 ***	1.197 **
	3.404	3.150	2.585	2.193	3.117	2.591
lnSELF	-0.186 ***	-0.182 ***	-0.123 **	0.087 ***	-0.205 ***	-0.210 ***
	-3.153	-3.078	-2.133	12.966	-3.080	-2.855
lnASSET	0.392 ***	0.440 ***	0.595 ***	0.339 ***	0.340 **	0.214
	3.498	4.117	6.084	21.424	2.560	1.374
Constant	-11.927 ***	-10.130 ***	-7.081 ***	(Omit)	-13.959 ***	-15.715 ***
	-6.034	-6.577	-4.871		-4.687	-3.846
R^2	0.707	0.702	0.690	0.999	0.401	0.451
Adjusted R^2	0.700	0.697	0.685	0.999	0.385	0.433
# of Observations	282	282	282	282	240	189
Wu-Hausman Test	5.462	3.133	0.980	11.401	4.857	4.857
(p-value)	0.486	0.679	0.964	0.077	0.434	0.434
Fixed or Random	Random	Random	Random	Fixed	Random	Random

*** : 1% critical value
** : 5% critical value
* : 10% critical value

Table 4

Rank and Combined index with HH/N and Y

Year	Area	HH/N	Area	Y	Combined Index
1998	KANTO AREA	2554202.7	TOKYO	16128425.1	TOKYO
	KANSAI AREA	1539297.0	SIGA	13536890.5	SIGA
	Tokyo	874394.5	FUKUI	13311919.4	CHUKYO AREA
	CHUKYOU AREA	739125.0	TOYAMA	13021808.7	KANTO AREA
	OOSKA	681482.0	CHUKYO AREA	12840389.6	TOCHIGI
	KANAGAWA	543081.0	SHIZUOKA	12609219.8	OOSKA
	HOKKAIDO	470886.2	TOCHIGI	12497111.4	GUNMA
	HYOUGO	402721.0	NIGATA	12418778.4	KANSAI AREA
	SAITAMA	401782.7	OSAKA	11977092.6	GIFU
	FUKUOKA	373313.2	FUKUSIMA	11951158.5	MIE
	CHIBA	354491.0	KANTO AREA	11768128.2	OKAYAM/KAGAWA
	SHIZUOKA	312253.5	NAGANO	11746167.1	HYOUGO
	TOKUSIMA	289574.0	GUNMA	11501039.6	KYOTO
	SAGA	279173.0	YAMAGATA	11440441.9	KANAGAWA
	HIROSIMA	275494.8	ISIKAWA	11403159.5	FUKUOKA
	MIYAZAKI	223707.5	GIFU	11149959.4	FUKUI
	OKAYMA/KAGAWA	211444.2	MIE	10950118.1	TOYAMA
	MIYAGI	199990.5	KANSAI AREA	10715575.1	HOKKAIDO
	YAMAGUCHI	197653.3	MIYAGI	10678742.2	CHIBA
	KYOTO	196135.2	SAGA	10459202.7	SAITAMA
	NIIGATA	192085.5	OKAYAMA/KAGAWA	10457348.1	WAKAYAMA
	NAGANO	181534.8	YAMANASI	10368114.0	SHIZUOKA
	KAGOSIMA	180542.0	IWATE	10324558.3	NIGATA
	AOMORI	174670.0	HIROSIMA	10131498.0	NARA
	FUKUSIMA	169082.8	TOTTORI/SIMANE	10104285.3	SAGA
	KUMAMOTO	162442.5	AKITA	9964991.1	FUKUSIMA
	TOTTORI/SIMANE	153035.3	OOITA	9863683.7	YAMANASI
	OOITA	151349.0	HYOUGO	9742228.5	NAGANO
	YAMANASI	149379.0	KYOTO	9677817.1	TOTTORI/SIMANE
	OKINAWA	146908.0	YAMAGUCHI	9500831.4	YAMAGATA
	EHIME	143337.0	KANAGAWA	9401797.6	ISIKAWA
	NAGASAKI	141217.3	FUKUOKA	9179906.3	AKITA
	AKITA	131442.7	KUMAMOTO	9029275.0	OOITA
	TOCHIGI	129959.6	TOKUSIMA	8997820.9	YAMAGUCHI
	FUKUI	123743.5	HOKKAIDO	8723688.2	MIYAGI
	IWATE	117103.0	EHIME	8686726.0	TOKUSIMA
	TOYAMA	115229.3	AOMORI	8632318.1	IWATE
	GUNMA	111179.8	CHIBA	8536929.5	HIROSIMA
	GIFU	109425.2	WAKAYAMA	8270460.0	AOMORI
	KOUCHI	109003.0	SAITAMA	8248354.0	KUMAMOTO
	MIE	104319.7	NAGASAKI	7965613.3	MIYAZAKI
	NARA	98366.6	MIYAZAKI	7867498.9	OKINAWA
	ISIKAWA	97594.8	OKINAWA	7743340.5	EHIME
	YAMAGATA	92565.0	KOCHI	7630475.0	KOCHI
	SIGA	82373.6	NARA	7611656.8	NAGASAKI
	WAKAYAMA	78218.6	KAGOSIMA	7280970.6	KAGOSIMA
	Average	366324.0	Average	10914857.5	
	Average without Three Main Area	196358.0	Average without Three Main Area	9955015.1	

——— :Average Line excluding Three Main Area
- - - - :National Average Line

Rank and Combined index with HH/N and Y

Year	Area	HH/N	Area	Y	Combined Index
1998	KANTO AREA	2596759.0	TOKYO	16217603.1	TOKYO
	KANSAI AREA	1561434.0	SIGA	13573485.1	SIGA
	TOKYO	888516.2	FUKUI	13247932.9	CHUKYO AREA
	CHUKYOU AREA	750544.2	CHUKYO	12982879.6	KANTO AREA
	OOSAKA	689945.8	TOYAMA	12820828.7	TOCHIGI
	KANAGAWA	552596.5	SIZUOKA	12562887.8	OSAKA
	HOKKAIDO	476399.4	TOCHIGI	12381715.9	GUNMA
	HYOUGO	410038.8	NIGATA	12249972.0	KANSAI AREA
	SAITAMA	408753.3	OSAKA	12012460.1	GIFU
	FUKUOKA	379156.2	FUKUSIMA	11939887.3	MIE
	CHIBA	360755.0	NAGANO	11829423.1	OKAYAMA/KAGAWA
	SIZUOKA	316401.0	KANTO AREA	11761855.2	KYOTO
	TOKUSIMA	292706.0	GUNMA	11595970.1	HYOGO
	SAGA	281746.0	ISIKAWA	11522725.0	KANAGAWA
	HIROSIMA	278284.3	YAMAGATA	11470674.7	FUKUOKA
	MIYAZAKI	226358.0	GIFU	11192239.5	FUKUI
	OKAYAMA/KAGAWA	214122.0	MIE	10870075.9	HOKKAIDO
	MIYAGI	202758.5	MIYAGI	10846026.2	TOYAMA
	YAMAGUCHI	199729.0	YAMANASI	10789070.8	CHIBA
	KYOTO	198383.4	KANSAI AREA	10676131.3	WAKAYAMA
	NIGATA	194002.8	SAGA	10581832.6	SAITAMA
	NAGANO	183942.0	IWATE	10518707.2	SIZUOKA
	KAGOSIMA	182398.5	OKAYAMA/KAGAWA	10223354.9	NARA
	AOMORI	176459.7	TOTTORI/SIMANE	10183527.2	NIGATA
	FUKUSIMA	171053.8	HIROSIMA	10125059.2	YAMANASI
	KUMAMOTO	164433.8	AKITA	9959308.3	SAGA
	TOTTORI/SIMANE	154542.0	OOITA	9881434.2	FUKUSIMA
	OOITA	153009.3	KYOTO	9612687.4	NAGANO
	YAMANASI	151337.5	HYOUGO	9505901.9	TOTTORI/SIMANE
	OKINAWA	150209.3	YAMAGUCHI	9467128.0	ISIKAWA
	EHIME	144640.8	KANAGAWA	9254373.1	YAMAGATA
	NAGASAKI	142405.3	FUKUOKA	9077811.2	AKITA
	AKITA	132566.0	KUMAMOTO	9074000.9	OOITA
	FUKUI	125237.5	TOKUSIMA	9048998.0	MIYAZAKI
	IWATE	118136.5	AOMORI	8802578.1	YAMAGUCHI
	TOYAMA	116614.7	HOKKAIDO	8728468.2	IWATE
	GUNMA	112780.8	CHIBA	8649250.9	TOKUSIMA
	GIFU	110830.5	EHIME	8443013.1	HIROSIMA
	KOUCHI	109992.7	WAKAYAMA	8421365.9	AOMORI
	TOCHIGI	109847.8	SAITAMA	8183597.7	MIYAZAKI
	MIE	105746.3	MIYSAZAKI	8046391.1	KUMAMOTO
	NARA	99734.0	NAGASAKI	7892732.2	OKINAWA
	ISIKAWA	98839.3	OKINAWA	7757722.6	KOCHI
	YAMAGATA	93494.5	NARA	7695794.8	EHIME
	SIGA	84301.4	KOCHI	7662389.6	NAGASAKI
	WAKAYAMA	79030.6	KAGOSIMA	7354486.2	KAGOSIMA
	Average	368596.0	Average	10917504.4	
	Average without Three Main Area	196713.0	Average without Three Main Area	9580832.9	

——— :Average Line excluding Three Main Area
- - - - :National Average Line

Rank and Combined index with HH/N and Y

Year	Area	HH/N	Area	Y	Combined Index
2000	KANTO AREA	2637072.3	TOKYO	16121017.8	TOKYO
	KANSAI AREA	1581784.8	SIGA	13750090.7	SIGA
	TOKYO	901783.5	FUKUI	13481895.5	CHUKYO AREA
	CHUKYO AREA	760778.8	CHUKYO AREA	13083227.3	KANTO AREA
	OSAKA	698110.4	TOYAMA	12898190.2	TOCHIGI
	KANAGAWA	561195.5	SIZUOKA	12825368.7	OSAKA
	HOKKAIDO	481949.6	TOCHIGI	12644485.6	KANSAI AREA
	HYOGO	416301.8	NAGANO	12344570.3	GUNMA
	SAITAMA	415672.0	NIGATA	12331781.6	GIFU
	FUKUOKA	384572.6	OSAKA	11988048.6	MIE
	CHIBA	367016.0	FUKUSIMA	11866675.0	OKAYAMA/KAGAWA
	SIZUOKA	320478.0	KANTO AREA	11743499.2	KYOTO
	TOKUSIMA	295137.0	ISIKAWA	11441145.2	HYOGO
	SAGA	284506.0	GUNMA	11396086.6	KANAGAWA
	HIROSIMA	280703.5	GIFU	11294018.2	FUKUOKA
	MIYAZAKI	228729.0	MIE	11045833.4	FUKUI
	OKAYAMA/KAGAWA	216129.4	YAMANASI	10917660.3	HOKKAIDO
	MIYAGI	205242.8	YAMAGATA	10899959.6	TOYAMA
	YAMAGUCHI	201206.3	IWATE	10844823.1	CHIBA
	KYOTO	200614.4	MIYAGI	10799706.7	SAITAMA
	NIGATA	195903.8	KANSAI AREA	10760218.5	WAKAYAMA
	NAGANO	186305.3	SAGA	10454932.4	SIZUOKA
	KAGOSIMA	184052.5	TOTTORI/SIMANE	10249106.5	NARA
	AOMORI	177874.0	OOITA	10246144.0	YAMANASI
	FUKUSIMA	172859.5	HIROSIMA	10228847.3	FUKUOKA
	KUMAMOTO	166043.0	OKAYAMA/KAGAWA	10173102.8	NIGATA
	TOTTORI/SIMANE	156040.3	KYOTO	9955641.3	SAGA
	OOITA	154543.7	AKITA	9867281.1	FUKUSIMA
	OKINAWA	153644.0	HYOGO	9664825.9	TOTTORI/SIMANE
	YAMANASI	153352.5	YAMAGUCHI	9609780.3	OOITA
	EHIME	145726.0	KUMAMOTO	9493010.8	ISIKAWA
	NAGASAKI	143538.8	KANAGAWA	9316006.6	AKITA
	AKITA	133676.0	FUKUOKA	9246104.4	YAMAGUCHI
	FUKUI	126405.0	AOMORI	9065091.0	YAMAGATA
	IWATE	119131.8	TOKUSIMA	9026757.1	MIYAGI
	TOYAMA	118063.3	HOKKAIDO	8781644.4	IWATE
	GUNMA	114403.0	EHIME	8684004.6	TOKUSIMA
	GIFFU	112039.0	CHIBA	8612373.4	HIROSIMA
	TOCHIGI	111288.5	WAKAYAMA	8417302.4	AOMORI
	KOUCHI	110810.7	SAITAMA	8261903.2	KUMAMOTO
	MIE	107036.2	NAGASAKI	7874540.8	MIYAZAKI
	NARA	101021.0	MIYAZAKI	7864816.0	OKINAWA
	YAMAGATA	100257.0	KOCHI	7849686.6	KOCHI
	ISIKAWA	100023.8	OKINAWA	7831430.7	EHIME
	SIGA	85991.2	NARA	7691531.5	NAGASAKI
	WAKAYAMA	79746.0	KAGOSIMA	7465743.5	KAGOSIMA
	Average	373385.0	Average	10984823.9	
	Average without Three Main Area	198847.0	Average without Three Main Area	9616441.5	

——— :Average Line excluding Three Main Area
- - - - :National Average Line