Cost benefit analysis of the digital terrestrial broadcasting in Japan

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Abstract

In Japan, shift to the digital terrestrial broadcasting (DTB) were started in December, 2003. But this shift is proceeded by the policy initiative, the consumer benefit is considered hardly. But whether the diffusion of DTB moves ahead as in the policy or not is due to the judgment of the consumer. Therefore, using some methods, it does the cost benefit analysis of DTB. Also, with the result of analysis and the diffusion situation of DTB, it reviews the broadcasting policy. As a result of these considerations, the diffusion of DTB is behind, consumer can not find the benefit corresponding to the cost About the political side, it clarified that the transition period of DTB isn't enough. So two policies are proposed for this problem. One is to extend the transition period. Another is to support purchase of Digital TV.

1. Introduction

In Japan, the revision of the Radio Law in 2001 showed that the use of the frequency by the analog terrestrial broadcasting (ATB) stops within 10 years and switches to the digital terrestrial broadcasting (DTB). According to this law, ATB is planed to stop in July, 2011 and shifted fully to DTB.

Shifting to DTB is advertised by all the media. But whether the shift is moving ahead sufficiently is doubtful. This shift is proceeded by the policy initiative, so the consumer benefit isn't too much considered. However the consumer purchases Digital TV at his judgment. As for this shift, it is necessary to review from the viewpoint of the consumer. In other words, it becomes important to evaluate cost and benefit at the consumer, and to check its consistence with the policy.

Economic studies about TV broadcasting were done from some decades ago, like Coase (1966). Bate (1987) mentioned that economic studies about TV broadcasting were developed from 1950 to 70. There are two reasons of economic studies about TV broadcasting. One is that TV broadcasting is severely regulated industry and another is that TV broadcasting treats two kinds of good, content and public access.

There are many kinds of approach in economic studies about TV broadcasting, like institutional economics, industrial Organization, optimal supply of the content, and theory of public broadcasting. Evaluation of benefit is an approach of economic studies about TV broadcasting.

Some studies like Wiles (1963) , Plratten (1970) , Wober (1987) , Enrenberg & Mills (1990) , Onoe, Sakamoto, & Arai (1993), tried to evaluate benefit of TV by CVM(Contingent valuation method). Other studies like Spence & Owen (1977) , Wildman & Owen (1985), Papandrea (1997), evaluated by RCM(Replacement Cost Method). But in recent years, benefit evaluation is hardly done like those studies.

On the other hand, DTB is one of the hot themes in Japan. But expanding service area and fusion of telecommunication and broadcasting are mainly discussed without considering about diffusion and benefit of consumer. A study of DTB by the viewpoint of policy isn't too much done.

The purpose of this study is to clarify the present situation about the diffusion of DTB in Japan. The main purpose is to evaluate the cost and benefit of that for consumer, and the broadcasting policy. By analyzing existing statistical data, progress on the diffusion of DTB is evaluated. And each the cost and the benefit is considered by the viewpoint of economics. Specifically, as for the cost, it reviewed with the demerit of the hardly discussed digital broadcasting in addition to the money load of consumer.

The result indicates that the diffusion of DTB is behind, consumer benefit is not enough, and the broadcasting policy must be improved.

In the following, Section 2 is analysis about the present situation of DTB in Japan. Section 3 is consideration about the cost of DTB. Section 4 is evaluation of the benefit of DTB. Section 5 is discussion of the cost and benefit of DTB, and of the policy problem about that. Finally, conclusion is mentioned section 6.

2. Diffusion of DTB

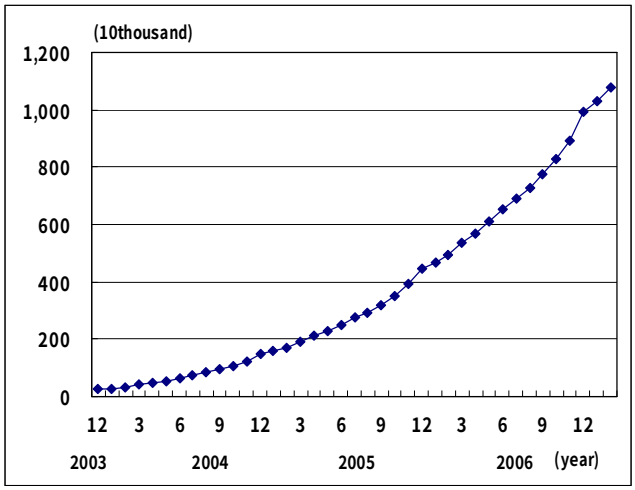
2.1. Number of TV

According to “National Survey of Family Income and Expenditure 2004”, TV possession per 1,000 households is 1,882; CRT 1,784, LCD 77, PDP 21. “Population Census 2005” shows that the number of households is 49,566,305. So the number of TV in Japan is supposed to be 93,283,786. This number of these several years is changing hardly because TV spreads approximately to all households and its durable period is stable. According to “National Survey of Family Income and Expenditure 1999” and “Population Census 2000”, the number of TV

in Japan was also supposed to be about 93 million.

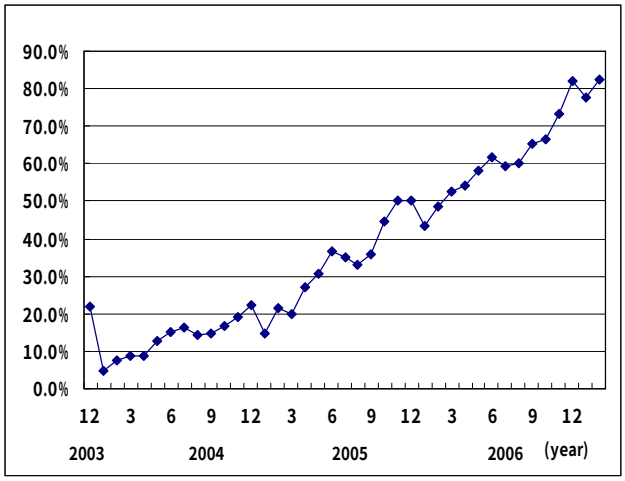
2.2. Number of Digital TV

According to the statistic data of the Japan Electronics and Information Technology Industries Association (JEITA), the number of Digital TV that can receive the wave of DTB is changing as shown in Figure 1. It reached 10 million at the end of 2006. The rate which the digital TV accounts for to the shipment number of the whole TV, too, is rising as Figure 2.



Source : JEITA

Fig1. Number of Digital TV



Source : JEITA

Fig2. Rate of Digital TV to all shipment

2.3. Problem of Diffusion

The diffusion of Digital TV is moving ahead, but it is behind in to the policy goal. Ministry of Internal Affairs and Communications (MIC) was declaring 12 million Digital TV in the middle of 2006 as a policy goal. Also, MIC makes 100 million Digital TVs a goal by July, 2011 when ATB stops. There is a way of thinking that this 100 million goal includes recording device. But it is not appropriate because there are more than 90 million TV and 50 million recording devices in Japan. And estimating from the present diffusion trend, the number of Digital TV will reach only 60 million by July, 2011.

In the first place, the impossibility is in policy goal itself. The shipment number of the TV isn't changing for these about 10 years. Rather, because of the durable improvement, there is shipment number to be on the decline. Regrettably, DTB doesn't become the factor which stimulates consumption of Digital TV in the present. The average shipment number of these several years is 10 million or more. If the consumer would not replace TV with ignoring its durable period, it takes about 10 years to replace 100 million. The difference between the policy goal and the number of shipment estimated by considering realistic consumer trend is shown in Figure 3. The gap of these two lines shows what an unrealistic consumption the government wants for the consumer.

Therefore, if the consumer doesn't try to accelerate replacing, 30 million TVs turns to be able to receive no broadcasting in July, 2011.

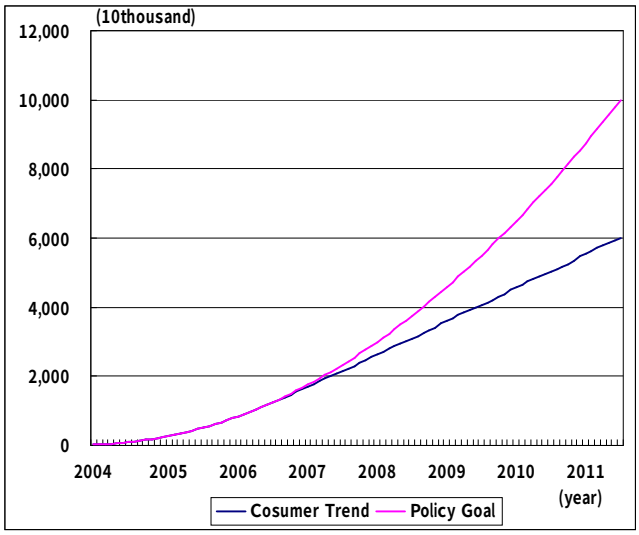


Fig3.Gap between Policy Goal and Consumer Trend

3. Cost of DTB

3.1. Environment Cost

3.1.1. Cost of Tuner

To watch DTB, the tuner or the TV with the tuner is necessary. The TV with the tuner is expensive but it isn't desirable to take all of these prices as the switching cost of DTB. Because, it includes is the additional value like the size, the thinness of the screen. Also, if replacing all TVs, residual value of 30 million TVs described by the gap in the Figure3 turns to be economic loss.

To take the price of the tuner as the switching cost isn't proper too. Because, it isn't possible for TV only with the tuner to do the time shift recording like an analog videocassette recorder. In Japan, a household has about 1.2 analog recorders including videocassette recorder and DVD recorder. Therefore, to take the price of the recorder with the tuner as the cost is appropriate.

It is about 50,000 yen with the lowest one in the market

price of the recorder with the DTB tuner. Multiplying the number of the TV in this price, the cost with total becomes about 4,664 billion yen.

3.1.2. Cost of Facility

To receive the broadcast-wave of DTB, generally, the UHF antenna becomes need. Because ATB is received by the VHF antenna, it can not be appropriated. Average price of UHF antenna is about 10 thousand yen. For detached houses and apartments, about 30 million antennas are needed. So the total cost of antenna becomes about 300 billion yen.

However, in the area of the part, the cost becomes need above the antenna. As for the digital broadcasting, the fuel-spray-travel is shorter than about the analog broadcasting. In the under-populated area which left a key station, TV broadcasting has a possibility not to be received. MIC has the policy goal that all households connect to the broadband. So they plan to use this broadband to retransfer DTB to the under-populated area. The optical fiber is indispensable to retransfer the wave of DTB. But, it expects that consumer is burdened with the part with the cost of broadband connection.

By the revision of the Radio Law in 2001, the spillover of broadcast-wave turns not to be admitted. This policy yields another cost. For example, in Tokushima Prefecture, there is only one private key station, because the TV in Tokushima receives the broadcast-wave of Osaka. There are 4 or 5 key stations in general Prefecture. Tokushima makes up the lack of the key station by the spillover. So shifting to DTB, the resident in Tokushima can watch only one private broadcasting, the broadcasting in Osaka can not be watched. This is a big loss in Tokushima. So Tokushima plans that all households connect to CATV and it retransfer the TV broadcasting in Osaka. As for this problem, Saga Prefecture is same. In these two Prefectures, the residents must pay a part of initial cost and operational cost of CATV.

It tries to estimate this cost. According to MIC, the rate of diffusion of CATV in Tokushima and Saga is 49.3%, 43.1% respectively. The households without connection to CATV are supposed to need connection fee. The number of household cannot receive DTB in the under-populated area is supposed to be same as the number that cannot connect broadband. This number is 2,510 thousand households. To avoid double count, under-connected households in Tokushima and Saga put away into another side. Initial cost of CATV is about 40 thousand yen and the cost of broadband in the under-populated area is supposed to be same. Operational cost depends on the service, and it is very cheap with only retransmission. So this study ignores operational cost. Based on such supposition, the initial cost of CATV and the broadband is estimated totally at 109 billion yen as shown in Table1.

3.2. Demerit of DTB

The digitalization of the terrestrial broadcasting gives us lots of merit such as, the image quality and the timbre are improved, the program search is possible, the data casting is available, interactive service is provided, and so on. But, there are parts of quality which the digitalization makes drop from the analog broadcasting, too.

	Houshold	Cost (thousand yen)
No CATV in Tokushima	117,151	4,686,026
No CATV in Saga	103,883	4,155,310
Retransmission by broadband	2,510,000	100,400,000
Sum	2,731,033	109,241,336

Table1. Cost of CATV and Broadband for DTB

Typical demerit of DTB is delay of broadcasting. The large data transfer or the data processing such as the encoding at the broadcast station and the decoding at the DTB tuner would be delay factor. Such a delay also influences the convenience of the TV. The time where a screen is displayed after putting a switch becomes longer. The speed of changing the channel like zapping, too, becomes later.

3.3. Present Situation of Delay

3.3.1 Method of Investigation

The delay occurs surely but to occur how isn't clear. So a field investigation is implemented to deduce the fact of delay in DTB and to analyze the delay factor. The unique protocol which measures delay is set to the system of DTB, but the cooperation of the broadcast station and expensive measuring equipment are indispensable. So the delay time is measured from the difference of the display-screen between DTB and ATB. According to the hypothesis that the transmission distance influences delay, key stations in Nagoya, Osaka in addition to Tokyo are set as the cardinal point and measurement of the delay time are done at the regular interval distances from each key stations. Also measurement was made about two groups of broadcast stations.

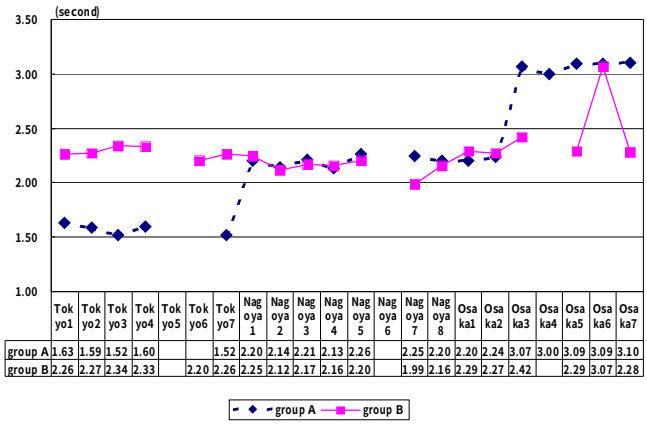
3.3.2 Result of measurement

The measurement spots were set based on the service area map of DTB by MIC, but TV could not receive a wave in a few points. It assumes that those were occurred by the electromagnetic wave interference by the obstacles such as the building and the mountain. Also, there was a few points that only one group to receive.

The result of the measurement was as shown in Figure4. and it is possible to observe that the delay in 1.52 - 3.10 seconds on DTB than ATB. Also, Figure4. shows that the tendency of the delay is different by groups.

Group A is changing like stairs, and group B is constant. At the key station in Tokyo, the delay time of group B is behind more for about 0.7 to 0.8 seconds than group B. At the key station in Nagoya, the delay time of group A and group B is same. At the key station in Osaka, the delay time of group A is behind more for about 0.6 to 1.0 seconds than group B. Group B has the irregular measured value at the spot, Osaka6, it is assumed to be because group B tried the system of group A. And the measured values at the spots, Osaka1 and Osaka2 is

opposite with that. In other words, it assumed that group A tried the system of group B.



	Tokyo1	Tokyo2	Tokyo3	Tokyo4	Tokyo5	Tokyo6	Tokyo7	Nagoya1	Nagoya2	Nagoya3	Nagoya4	Nagoya5	Nagoya6	Nagoya7	Nagoya8	Osaka1	Osaka2	Osaka3	Osaka4	Osaka5	Osaka6	Osaka7
group A	1.63	1.59	1.52	1.60			1.52	2.20	2.14	2.21	2.13	2.26		2.25	2.20	2.20	2.24	3.07	3.00	3.09	3.09	3.10
group B	2.26	2.27	2.34	2.33		2.20	2.26	2.25	2.12	2.17	2.16	2.20		1.99	2.16	2.29	2.27	2.42		2.29	3.07	2.28

Fig4. Result of measurement at each spot, the blank columns are the spot which could not receive a wave.

3.3.3 Analysis of the delay factor

From the hypothesis, the delay time of DTB would changes in some factors, a distance to the key station from Tokyo, a distance to the measurement spot, and existence or non-existence at the relay station. In addition to them, there is fixed delay factors like encoding, decoding, and synchronization of data, which doesn't change by the distance.

Therefore, the delay time can be expressed at the function below. We verified a hypothesis (function) by a multi regression analysis which used measured values. That analysis was done for each group of broadcast stations.

$$Y = aX_1 + bX_2 + cZ + d$$

Y: Delay time

X_1: distance to the key station from Tokyo

X_2: distance to the measurement spot from the key station

Z: existence or non-existence at the relay station

a,b,c: regression coefficient

d: fixed delay factor

Result of analysis are shown as below functions. The distance from Tokyo to the key station and the fixed factor like encoding have an influence on the delay time of the DTB of group A. Only fixed factor influenced to the DTB of group B.

groupA : $Y=0.0032X_1+1.5156$

groupB : $Y=2.28053$

3.4 Economical Inflict by Demerit

The terrestrial broadcasting is the service which most people are watching, and the digitalization forces the consumer who is satisfied with the present analog services into the additional cost burden. Therefore, in the aspect of the service, there should be no decline in DTB compare to ATB. So the demerit of DTB like delay and low response are supposed to give consumer an economic inflict.

Most TV programs don't need immediacy, and these days people watch those through recording. Therefore, there will be few persons who feel several seconds delay as a loss. However, in case of emergency information transmission, the loss occurs. The earthquake is a typical example. The information system which can estimate arrival times of seismic waves and seismic intensities are developing in Japan. Though TV is still first media for the getting of urgent information in Japan. So the people watching DTB would be behind in the taking refuge more for several seconds than those of ATB. In case of the big earthquake, the delay in several seconds leads to the expansion of the damage.

Delay has other problems. Some TV programs have the communication chance between MC and audience. But it's difficult for DTB, because the acceptable standard of the delay on the IP telephony is equal to or less than 400 ms, which is shorter than the delay of DTB. The interactive TV program that the audience participates in quiz program such as "first come, first serve" cannot be done. Because the delay time is different among areas.

Also delay causes the law response of operating TV. Low response of Digital TV gives consumer a stress. And it is supposed to be converted to the economic inflict.

4. Benefit of DTB

4.1 Net Benefit for Consumer

"Action Plan for developing DTB" by the MIC explains that the merit of DTB is as follows.

- High Definition TeleVision (HDTV)
- Data casting and Interactive service
- Mobile/portable reception
- Kind Service for the aged people and the disabled person
- User-friendliness of audience (Electronic program/ Broadcasting based on a home server)

Considering the diffusion of technology and service, it isn't possible to call all of these as benefits of DTB. To use interactive service, it is necessary for Digital TV to connect the Internet. But there is few TVs connecting to the Internet, and it expects that this tendency continues in the future. So it is difficult to take interactive service with the benefit. As for "Kind Service for the aged people and the disabled person€, 3Sound-Multiplex TV Broadcasting is provided for ATB from before. Therefore, caption display is one of the merits of DTB.

Electronic program is also provided for ATB. And broadcasting based on a home server is not the service of DTB. That is realized by the home server or the hard disk recorder. So it is difficult to take €U3e4-friendliness of audience" with the benefit of DTB.

With above considering, the net benefit of DTB is as follows.

- High Definition TeleVision (HDTV)
- Data casting
- Mobile/portable reception
- Caption display

4.2 Benefit of HDTV and Data Casting

4.2.1 Impact of HDTV and Data Casting

High-quality video provides the consumer a benefit most. MIC research shows as follows. 65.6% of the DTB user is satisfied with the service and 94.3% of that is satisfied with the video quality. To want to see HDTV is the first reason for buying Digital TV without the end of durable period of TV. Data casting isn't expected as much as HDTV. Only 39.9% of satisfied DTB user is satisfied to data casting. And it becomes a reason hardly for buying Digital TV.

4.2.2 Value of HDTV and Data Casting

HDTV and data casting are evaluated by SPM (Stated Preference Method). Because DTB is not so popular now, so it is difficult to evaluate it. Arai (1995) tried to evaluate those benefits by the willingness to pay (WTP) of consumer. WTP for HDTV depends on the kind of the program. And average of that is 707.3 yen / week. This investigation had done in the Toyama prefecture. This value is composed by three broadcasting station. One is NHK, a public broadcasting station and two are KNB and BBT, commercial broadcasting companies.

As for data broadcasting, there in no article evaluating a benefit it. But Arai (1995) evaluated the similar service named “Still Picture broadcasting”. Its WTP is 2,908.8 yen / year.

4.2.3 Review of Evaluation

The investigation of Arai (1995) was done more than 10 years ago. So the evaluation of the additional value has the possibility to be changing. Then the conjoint analysis with a small size sample was done to reviews the probability of these datas.

To make questionnaire easier, attributes and levels are set as Table2. It supposes NHK. The number of profile is decreased by using orthogonal array. Eight choice sets are made by the shifting levels of each attribute, according to Louviere, Hensher & Swait (2000). It distributed a questionnaire to the colleague of the author and it got 80 answers.

Answers are analyzed by the conditional logit model. The conditional logit model is described following formula.

$Prn(i|C) = \exp(V_{in}) / \Sigma_{j\in C}\exp(V_{jn})$

Prn(i|C) : Probability that “n” chooses “i” from choice set “C” .

V_{in} : Value that “n” get from “i” • In this trial, “V_{in}” can describes as below.

$V_{An} = v_P P_A + v_M M_A + v_D D_A$

$V_{Bn} = v_P P_B + v_M M_B + v_D D_B \quad V_{Cn} = v_{ASC} ASC$

β: coefficient

P, M, D : variables mean Price, Merit and Demerit

ASC : constant term

Attribute		Level		
Merit	HDTV and Data casting	Not provided	Provided	
Demerit	Delay and Low response	Not happen	Happen	
Costr (yen/month)		1,000	2,000	3,000

Table2. Attributes and Levels for Conjoint Analysis

In the conditional logit model, maximizing the following logarithm likelihood function “lnL” could estimate “β” .

$lnL = \Sigma_n \Sigma_{j\in C} d_{in} ln Pr_n(i|C)$

d_{in} : dummy variable that is “1”, if “n” chooses “i” .

Following result is gotten.

$\beta_P = -0.0019$

$\beta_M = 2.4632$

$\beta_D = -0.6510$

The p-value of β_D is not small enough, this independent variables does not predict the dependent variables. But the p-value of β_P is small enough, so from those coefficients, WTP for HDTV and data casting of NHK is estimated at 1,300 yen / month.

Arai (1995) estimated HDTV of NHK at 291.7 yen / week and data casting at 242.4 yen / month. There are few differences between Arai (1995) and this review. Therefore the data of Arai (1995) is valid at present.

4.2.4 Benefit Evaluation of HDTV and Data Casting

According to Arai (1995), HDTV of commercial broadcasting company is estimated at about 207.8 yen / week. WHITE PAPER Information and Communications in Japan shows that the number of the average commercial broadcasting company is 4.86.

By these values the benefit of HDTV and data casting is estimated at about 70,778 yen / year as shown in Table3. When multiplying the population of Japan by this value, the benefit in the whole Japan becomes 9,042 billion yen / year.

	Benefit (yen/year)	Benefit (yen/week)
HDTV of NHK	15,210	291.7
HDTV of Commercial Broadcasting Companies	52,659	207.8
Data casting	2,909	-
Sum	70,778	-

Table3. Benefit of HDTV and Data Casting

4.3 Benefit of Mobile/portable reception and Caption Display

Watching TV clearly at the Mobile/portable device is a benefit of DTB. In Japan, One segment broadcasting service (One-Seg service) is provided for Mobile/portable

device. It was started in April 2006. Integrated Services Digital Broadcasting-terrestrial (ISDB-T) is the standard for DTB in Japan. ISDB-T, using the hierarchical transmission method, divides the 6 MHz bandwidth of one channel into thirteen segments. 12 segments is to transmit an HDTV channel and one more segment is to provide One-Seg service.

Mobile phone, car navigation system, and laptop computer are typical devices to receive One-Seg service. But there is no former study about the benefit of this. The benefit can be estimated by the price of these devices. But it is not correct because it does not include consumer surplus. And this study focuses on the shift to DTB, so devices in home are important. Therefore, the benefit of Mobile/portable reception is not evaluated in this study.

The benefit of caption display is easy to evaluate by RCM (Replacement Cost Method). In ATB, the equipment cold "Teletext Decoder" to see caption is particularly sold. So the benefit can be evaluated by the price of "Teletext Decoder".

Generally, "Teletext Decoder" is sold at about 80,000 yen. And The number of hearing-impaired person is about 361 thousand. So the benefit of Caption display of DTB is estimated at about 29 billion yen.

5. Discussion

5.1 Cost Benefit Analysis

This study describes cost benefit analysis and evaluation the broadcasting policy. Estimating the cost and benefit of DTB, these turns to comparable. The cost of tuner and reception facilities for all consumer is estimated at 5,073 billion yen. The benefit of consumer is estimated at 9,042 billion yen / year by HDTV and data casting and at 29 billion yen by caption display. Therefore, the 1 year benefit exceeds cost.

However, cost is estimated too little and benefit is overestimated. Analog TV and video have a tuner to each. So 50 million tuners for substituting videos might be more necessary to make the same environment in ATB. The reception facilities also might cost more. Because only direct consumer payment is evaluated. But providing optical fiber with the under-populated area need more cost. MIC estimates that cost at 408 thousand yen / household. It is about 10 times consumer payment. Consumer pays this cost indirectly at the tax. Considering these cost, about 1,900 billion yen is more necessary for the environmental of DTB.

On the other hand, the benefit of HDTV is estimated in the condition that all programs are provided with HDTV. But in commercial broadcasting companies without NHK, the rate of HDTV is expected about 70%. Multiplying this rate in the benefit, it turns to be about 6,552 billion yen / year. Therefore, the 1 year benefit falls bellow the cost.

5.2 Consideration on Broadcasting Policy

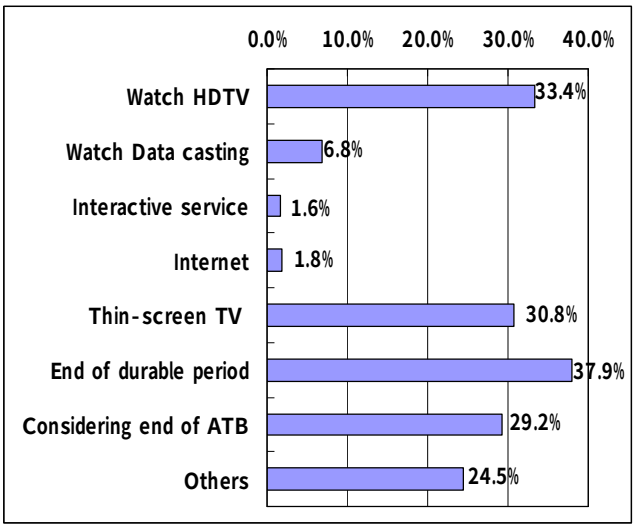
Considering the diffusion of Digital TV, Japanese government underestimated the transition period to DTB. The durable period of TV is stable and consumer does not replace it by force. To forward the diffusion of DTB, its benefit must exceed cost roughly. But evaluating in the short period, cost might be higher than benefit. In the long period, benefit could exceed cost roughly. The present situation shows that the demand of DTB is not created. It thinks that the consumer isn't evaluating benefit in the so long period.

The estimated benefit in this study is average. So some consumers don't suppose any benefit for DTB. The reason why they replace TV is only the end of durable period. They account for 1/3 of the Digital TV buyer as shown in Figure5. They might not replace TV by force even if July, 2011 comes. Two policies are proposed for this problem.

One is to extend the transition period. As the average durable period of TV is about 9 year, it had better extend for about 3 years. Some countries had already extended the transition period. According to Adda and Ottaviani (2005), the UK government initially expected the period 2006–10. But the BBC suggested that 2012 is the most appropriate. The U.S. also planned to stop ATB in the end of 2006, but the switchover plan was revised in 2006 and that time was postponed until February, 2009.

Another is to support purchase of Digital TV. Some countries adopt this policy. According to Nakamura, Toyota & Kibata (2005), the Italian government paid for STBs about 110 million EUR in each 2004 and 2005. Though it is difficult to exclude the consumer who gets benefit from DTB, it's possible to support the low-income people like Berlin. It is better to do in the end part of the transitional period and to support by tuner and antenna themselves not by money.

To tackle the increase of benefit, the reduction of cost, too, is important. The rate of the HDTV program should become 100%. Delay and low response also should be improved. Because the delay of the emergency information transmission influences human life, delay must be improved immediately.



Source : MIC

Fig5. Reason for purchasing Digital TV

5.3 Recommendations

Cost benefit analysis in this study, the demerit of DTB like delay and low response is not evaluated quantitatively. Neither is the benefit of “Mobile/portable reception”. There is room to do more precisely in the cost benefit analysis. Further study would be required to clarify the more detailed cost and benefit. Conjoint analysis is used to confirm the value of the former study, it is suitable for the cost benefit analysis. If conjoint analysis applies to the further study, to set more minutely attributes and levels, and to investigate more large samples is necessary.

6.Conclusion

It clarified the present situation of DTB in Japan from the statistical data. And by some analytical methods, the cost benefit analysis of DTB is done. Also, based on these results, the broadcasting policy is considered.

The diffusion of DTB is behind to the policy goal, consumer can not find the benefit corresponding to the cost. About the political side, it clarified that the transition period of DTB isn't enough. If the diffusion moves ahead just as it is, replacement of existing TV might become a big social problem. So the policies to solve this problem are proposed in this study. But as for the detail of the policy, it is necessary to consider more. For example, when extending the transition period, the frequency redistribution and the new service it makes would be behind.

DTB gives consumer some merits, but they don’t have the impact to create the demand. Therefore, it is necessary to create more additional values, to reduce demerit on the DTB, too. To have clarified the problem of the broadcasting policy in this way is the main contribution of this study.

Reference

[1] Coase, R. H., Economic of Broadcasting and Advertising-The Economics of Broadcasting and Government Policy, The American Economics Review Vol LM No.2. 1966.

[2] Bate, B. J., The Role of Theory in Broadcast Economics: A Review and Development, Communication Yearbook, 10, 1987.

[3] Wiles, P., Pilkington and the Theory of Value, Economic Journal, 1963.

[4] Plratten, C. F., The Economics of Television (P.E.P. 1971).

[5] Wober J. M., How much is Televison Worth? (IBA 1987).

[6] Andrew Enrenberg, Pam Mills, Viewers’ Willingness to pay (International Thompson Business Publishing 1990).

[7] Hisao Onoe, Yasuo Sakamoto, Hirosuke Arai, A Cost-Benefit Analysis of Television Broadcasting, Studies of Broadcasting No.29, NHK, 1993.

[8] Spence, M. Owen, B., Television Programming, Monopolistic Competition and Welfare, Quarterly Journal of Economics, Vol.91, No.1, 1977.

[9] Wildman S. S, Owen, B M., Program Competition, Diversity, and Multichannel Bundling in the New Video Industry; Video Media Competition, (New York, Columbia University Press 1985)

[10] Papandrea, F., Modeling Television Programming Choices, Information Economics & Policy, Vol.9, No.3, 1997.

[11] Hirosuke Arai, Economics of TV broadcasting (Souki-sya 1995).

[12] J. Louviere, David A. Hensher and Joffre D. Swait, Stated Choice Method : Analysis and Application (Cambridge University Press 2000).

[13] Adda, J. & Ottaviani, M, The Transition to Digital Television, Economic Policy, 20, 159-209, 2005.

[14] Yoshiko Nakamura, Kazuo Toyota, Yoko Kibata, The new trial of the digital broadcasting in Europe, The NHK Monthly Report on Broadcast Research, Vol.55, No.6 pp. 2～19, 2005