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Evaluating the Product Portfolio of Japanese Public Service Broadcaster: Consumer vs. Citizen's View

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Abstract

Media has been becoming increasingly diversified and public service broadcasters (PSBs) all over the world face new challenges by the Internet, and they have been restructuring their consistencies for the new environments. PSBs have been developing various management approaches by the diversification of transmission channels and the development of cross-media contents. The optimum deployment of distribution channels and content genres is currently becoming the top management priority, which is referred to as *Portfolio Management*. This approach for determining the portfolio of products and businesses will result in the most efficient strategic allocation of management resources. This paper thus takes NHK (*Nippon Hoso Kyokai*), Japan's PSB, as a research target, and analyzes its portfolio management. NHK has introduced the VFM (Value for Money) index through the measurement of WTP (Willingness to pay), and has initiated channel×genre matrix management. This study thus aims to estimate WTP of viewers' reception fees from the survey to viewers and distribute

WTP to the channel×genre matrix in order to analyze how viewers evaluate NHK and its programs. To evaluate whether NHK's channel×genre matrix management is oriented to the way as pay-TV or to public service value, PSM (Propensity Score Matching) is employed. Using PSM, the sample population is divided into two groups, the *consumer's view* and the *citizen's view*, and how the distributed WTP to genre is different between two groups is examined.

Keywords: WTP, product portfolio, channel-genre matrix, PSM, NHK.

1. Introduction

In accordance with the convergence of broadcasting and telecommunications, media has been becoming increasingly diversified and restructuring their business models and constituencies for the new environments. ICT makes it possible to manage the cross-media portfolio, offering products in multiple formats (Chyi 2012). The traditional legislation or regulation reflected on the vertical integrated media industries came to less relevant to the reality. In these environments, public service broadcasters (PSBs) all over the world are not independent from the reality and face new challenges. PSBs have been contributing to fulfill missions of broadcasters such as plurality, quality (high-standard), reliability and diversity and maintaining the touchy and conflicting balance between public and private objectives, particularly the latter is required for achieving efficiency of the management. The traditional discipline levied

on public organization such as equating revenues and costs does not necessarily lead to efficiency, but X-inefficiency.

In cope with this transformation, they have been restructuring their consistencies for the new environments. PSBs have been requested to develop various management approaches similar to other industries by the diversification of transmission channels and the development of cross-media contents. The optimum deployment of distribution channels and content genres is currently becoming the top management priority, which is referred to as *Portfolio Management* in Business Administration¹. This approach for determining the combination (portfolio) of a mix of products and businesses will result in the most efficient strategic allocation of management resources (Picard, 2005; Koschata, 2012; Coyle and Siciliani, 2013; Lin et al, 2013; Oliver, 2013; Wirtz et al 2013; Nissen, 2013 and 2014; Candel, 2014).

In this paper, based on recent various challenges for the “Portfolio Management” by media companies, we will submit the new approach by employing methodology from econometrics. The discussion will be done as follows:

First, past researches on the related fields are to be examined. These intend to employ the pay TV-like private management with various challenges for reconciling public values. Second, we will have the viewers’ evaluation by WTP (Willingness to pay) on Japanese public service broadcaster (PSB), NHK, and the allocations of the WTP for portfolio matrix (channel-genre) will be estimated. But this estimation lacks

¹ This concept was initiated by a consulting company (Boston Consulting Group 1970).

the influence by the difference between public and private values the viewers have. Third, therefore, we will introduce PSM (Propensity Score Matching) to examine the difference between *consumer's view* and *citizen's view* and supplement the above portfolio matrix for the PSB's management. Finally, this paper's implication and limitation will be described.

2. Past Research

As summarized by Coase (1966) and Peacock (1986), the theoretical model applied in public service broadcasting was that if the technology was established to deliver the service to specific recipients while confirming the existence of each recipient, by calculating the willingness to pay (WTP) it would be possible to match the needs of the recipient with the programs provided and consider public service broadcasting in the same way as pay-TV. This argument, however, underestimates the characteristic, for example, of the existence of externalities such as educational content and merit goods whose utility is determined only after consumption, and therefore did not lead to a consideration of the management of public service broadcasting simply through the use of WTP.²

Meanwhile, since the efficiency of resource allocation cannot be guaranteed, and therefore accountability for public expenditures cannot be maintained, practical solutions that examine the factors involved in the level of WTP have been challenged (Schwer and Daneshvary, 1995; Finn et al., 2003; Delaney and O'Toole, 2004).

² Concerning the difficulties of measuring productivity and managing diverse and ever-changing objectives, see BBC: the agony of managing 'Auntie', Financial Times, January 27, 2014.

Moreover, in recent years, there have been attempts to calculate the WTP for the value from the standpoint of consumers and value from the standpoint of citizens, and this has led to the conducting of trials regarding allocation by channel-genre units (Terrington and Dollar, 2005; DCMS, 2006; Ofcom, 2008).

At the BBC recently, the governing body, the BBC Trust, has indicated performance gaps and is aiming to apply these to management (BBC Trust, 2011), but this is mainly for the purposes of accountability and the resulting data do not appear to be actually put to practical use in management.

In the latest research, as well as Ratkovic-Njegovan et al. (2012) investigating the theoretical potential for the application of the portfolio strategy to public service broadcasting, Hsiang (2012) has broadened the scope to the optimum deployment of contents between media through WTP measurements.

As Litman et al. (2000) points out, the programs on each of the channels can be conceptualized and optimized as a product portfolio, but as stressed by McQuali (2003), especially in public service broadcasting, the emphasis should be placed on the creation of information as a public *communication good*, and it is thus necessary that it has value for the viewer, performs a social function, and moreover is cost efficient (Ratkovic-Njegovan et al., 2012). Additionally, it must also reflect diversity. The trend in the academic circles that study media management is now to move on from the conceptual studies to empirical research and then to strategic management (Wirz et al., 2013).

3. Estimation of Viewers' WTP

3.1 Survey methodology

In this section, the data used in this study is based on a public opinion survey (undertaken under the name of a think tank) conducted in January 2012³ with respect to 7,200 men and women aged 16 or over from the whole country extracted by the stratified two-stage random sampling method to survey as many respondents as possible and reflect the views of audience as accurately as possible in terms region, age, gender, and other respondent characteristics. Respondents were asked about WTP for terrestrial television services (NHK General and NHK Educational) and satellite services (BS1 and BSP), with scores tabulated to calculate the monetary value of NHK broadcasting services. Valid responses were 2,115 for the interview survey (valid response rate 58.8%) and 1,984 for placement survey (valid response rate 55.1%).

In addition to attributes such as gender, age and occupation, the survey examines the degree of expectation, the degree of importance of and degree of satisfaction felt toward each channel, and the degree of importance of and degree of satisfaction felt toward each of the program genres with respect to a range of factors required of the public service broadcaster, NHK. A three-stage dichotomous choice method was carried out to measure the above four categories of WTP.

In the text of the questions, respondents are asked about a base amount of

³ This survey is commissioned by NHK, but conducted by a independent research company for the objective valuation on their performance See, <http://www.nhk.or.jp/corporateinfo/english/publication/pdf/plan2012-2014.pdf>
The data for this study is offered by NHK, but analyzed independently by the authors

JPY1,500 (approximately USD15.00), but after this question, they are asked a second time concerning a lower or higher amount, based on their answer to the question the first time, and the amount was again adjusted up or down, based on their answer. In order to reveal the true value, the standard method of questionnaire survey developed in the field of environment economics was employed, for instance. In the questionnaire survey, the following texts were mentioned to respondents.

3.2 Text of the WTP question

Assume that NHK's existing reception fee has been eliminated.

Based on that assumption, are you willing to pay JPY1,500 per month to watch to NHK's existing NHK General and NHK Educational television? This money will be used appropriately as a reception fee for creating programs provided by NHK and to support development of broadcasting technology and other operations necessary for maintaining public broadcasting. Since this amount is a monthly payment, please consider the effect that this amount will have on your household budget when answering.

Please note that answering this question will not affect the reception fee you pay to NHK.

3.3 Three stage dichotomous choice

After mentioning the above statements, a three stage dichotomous method is used for asking WTP, which is one of the standard methods to obtain true values of respondents.

The questionnaire survey related to WTP is as follows: To begin with the initial value is required to decide, which is the first amount to be asked to respondents. JPY1,500 (USD15.00) is selected as the initial value, since it is expected that the variation of replies are not widely distributed from the current reception fees. We begin by asking whether they would be willing to pay monthly reception fees of JPY1,500. If their answer is *yes*, they are then asked whether they would be willing to pay JPY2,500 (USD25.00). If they reply *yes* again to JPY2,500, then they are asked to answer the amount in mind. The amount they reveal is their WTP. When they are asked whether they would be willing to pay JPY2,500, if they reply *no*, then we lower the amount to JPY2,000 (USD20.00). If they reply *yes* to JPY2,000, then that is their WTP. If again their answer is *no*, then we can determine their WTP is JPY1,500 (USD15.00). If they reply *no* to JPY1,500, this process is repeated by lowering the amount in the same manner until their WTP is determined. The tree of questions is shown in Figure 1.

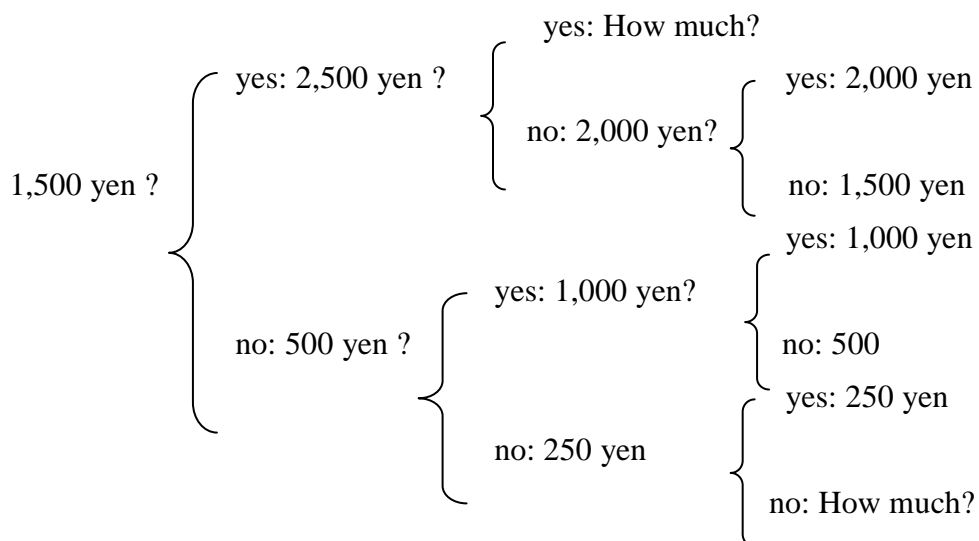


Figure 1 Three stage dichotomous choice

When calculating the WTP used in CVM, the number of respondents is designated, including those answering *JPY0* the universe and calculated WTP within the range of a maximum of JPY10,000 (USD100.00) in the case of terrestrial services and JPY5,000 (USD50.00) in the case of satellite services. Table 1 and 2 show respondent distributions of WTP.

Table 1 Distribution of WTP for terrestrial services

Value (JPY)	Total	Over 2,000	1,500~ 1,999	1,250~ 1,499	1,000~ 1,249	750~ 999	500~ 749	250~ 499	1~ 249	0
No. of response	2115	100	150	218	469	188	398	94	15	468
%	100	4.7	7.1	10.3	22.2	8.9	18.8	4.4	0.7	22.1

Table 2 Distribution of WTP for satellite services

Value (JPY)	Total	Over 3,000	2,500~ 2,999	2,000~ 2,499	1,500~ 1,999	1,000~ 1,499	500~ 999	250~ 499	1~ 249	0
No. of response	2115	73	161	84	333	62	255	122	28	961
%	100	3.5	7.6	4	15.7	2.9	12.1	5.8	1.3	45.4

4. Estimation of WTP of terrestrial and satellite broadcasting

Based on the above replied WTP of each user, the demand function of for services is estimated; more precisely, the probability of acceptance to amounts questioned and the number of users who will agree to pay. The functional form of demand to be estimated is assumed to be logistic, namely

$$\text{Probability of acceptance} = 1 - 1/(1 + \exp(-\alpha - \beta \log \text{WTP})) \quad (1).$$

4.1 Estimation Result

The probability of acceptance is the ratio of the number of users who reply that they are willing to use the device at the amount of charges provided in the questions. By plotting the probability of acceptance for the respective WTP along the logistic curve shown above, and parameters α and β are estimated. The estimated coefficients α and β are summarized in Table 3 and 4, and resulting estimated logistic curves are indicated in Figure 2 and 3.

Table 3 Estimation of logistic curves (terrestrial services)

	Coefficient	S. E.	t value	p value	
Constant α	8.464	1.982	4.270	0.000	***
Sex (male 1, female 0)	0.253	0.098	2.572	0.010	***
Age (logarithmic)	1.404	0.143	9.794	0.000	***
Income (logarithmic)	0.317	0.089	3.566	0.000	***
β_{bid}	1.218	0.356	3.421	0.000	***
Number of observations		1788			
Log likelihood		4607.182			
χ^2		9214.363			
Prob [$\chi^2 > \text{value}$]		0.000			

Note: * p<0.1, ** p<0.05, and *** p<0.01

Table 3 Estimation of logistic curves (satellite services)

	Coefficient	S. E.	t value	p value	
Constant α	4.636	2.412	1.922	0.027	**
Sex (male 1, female 0)	0.290	0.103	2.810	0.005	***
Age (logarithmic)	0.981	0.150	6.530	0.000	***
Income (logarithmic)	0.408	0.092	4.430	0.000	***
β_{bid}	0.832	0.470	1.771	0.044	**
Number of observations		1772			
Log likelihood		3978.236			
χ^2		7956.471			
Prob [$\chi^2 > \text{value}$]		0.000			

Note: * p<0.1, ** p<0.05, and *** p<0.01

4.2 WTP estimated

The average WTP value was estimated using the discrete choice model with a random utility function, based on the standard method of Hanemann (1895). The average WTP value is calculated by integration of the resulting logistic curve. The horizontal axis shows the WTP value and the vertical axis the acceptance rate. That is, for any WTP value indicated on the horizontal axis, the probability that the service will be accepted at that reception fee is the acceptance rate shown on the vertical axis. Assuming that the horizontal axis represents a continuous variable, the average WTP value can be calculated as the area below the estimated logistic curve.

$$E(WTP) = 1 - \int_0^{\infty} P(x_i; \hat{\alpha}, \hat{\beta}) = 1 - \int_0^{\infty} \frac{1}{1 + \exp[\hat{\alpha} - \hat{\beta} \log(x_i)]} \quad (2)$$

The WTP is obtained by calculating the area below the logistic curve. According to our estimates, respondents were willing to pay JPY2154.80 (USD21.55) monthly per viewer for terrestrial services (NHK General and NHK Educational) and JPY1247.30 (USD12.47) monthly per viewer for satellite services (BS1 and BSP). These amounts are higher than current reception fees (JPY1,275 (USD12.75) monthly, plus an additional JPY945 (USD9.45) monthly for satellite channels⁴).

⁴ This prices of the reception fees were at the time of the research

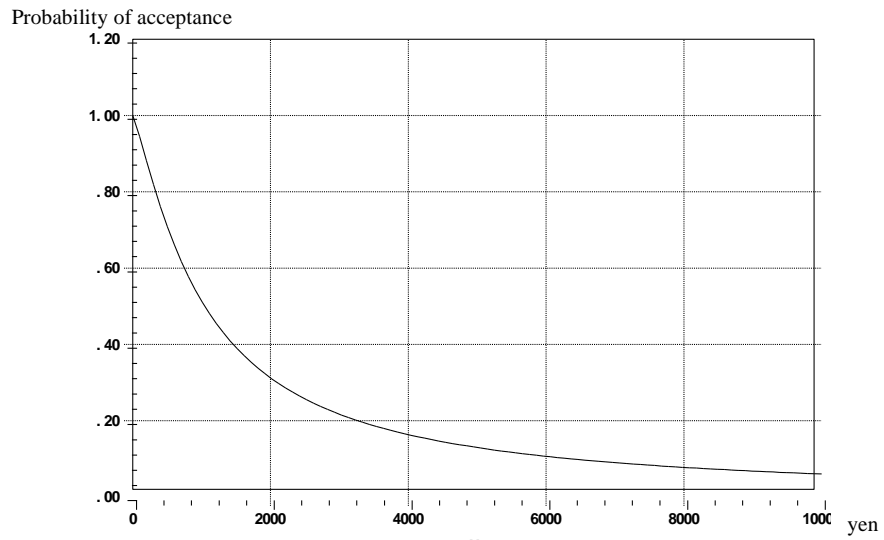


Figure 2 Estimated logistic curve for terrestrial services

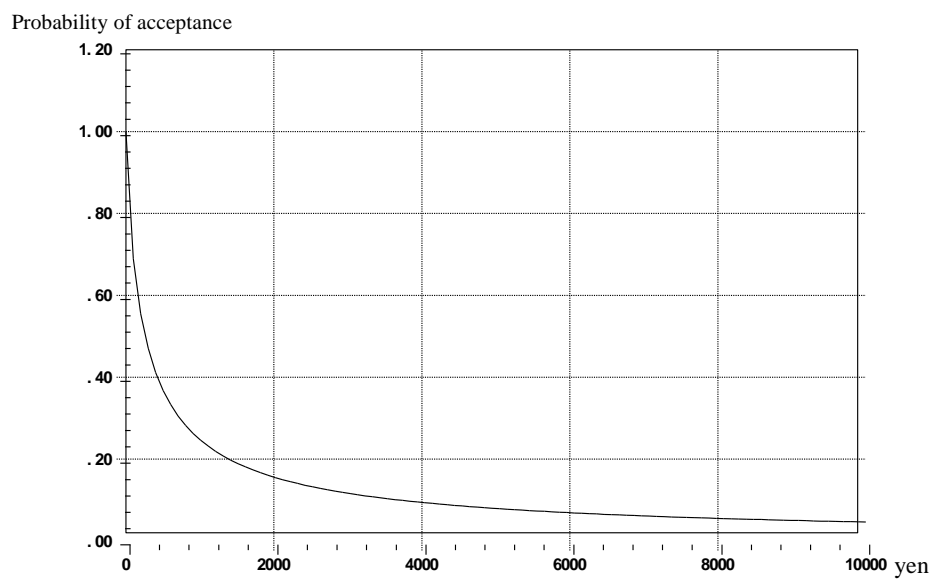


Figure 3 Estimated logistic curve for satellite services

4.3 Value of product portfolio of PSB

The objective of this section is to calculate the value of PSB's product portfolio based on the WTP estimated in the previous section. First, the WTP of terrestrial and satellite

services are decomposed into their channels, namely the former has two channels such as NHK General Channel (General), NHK Educational Channel (ETV), while the latter has BS1 and BSP. The ratios used for this purpose are those which each resonance was asked to relative importance for each of the respective terrestrial services (NHK General, NHK Educational and for those of satellite services, Broadcasting Satellite One (BS1) and Broadcasting Satellite Premium (BS Premium or BSP shortly). The average values of replies to the question to respondents are taken as ratios, which amount to 65.87% (General) and 21.58% (Educational) for terrestrial services and 52.99% (BS1) and 47.01% (BSP) for satellite services. The values of these channels are indicated by Table 4.

Table 4 WTP of each service

Terrestrial services		JPY2154.80	US\$21.55
	General	1419.3	14.1
	Educational	465.0	4.63
Satellite services		JPY1247.30	US\$12.47
	BS1	660.7	6.60
	BSP	586.3	5.86

4.4 Channel-genre matrix allocation of WTP

Next, the WTP value of each channel is decomposed into its genres. NHK categorizes all programs of four channels into ten genres, which are (1) News and commentary, (2) Sports, (3) Life information, (4) Youth and education, (5) Culture and welfare, (6) Science and nature, (7) Drama, (8) Entertainment, music and traditional performing

arts, (9) Movies and animations, and (10) Large-scale projects. There is no need to explain except (10). Programs produced under the name of major projects covers contemporary issues related to the Japanese society which are deeply analyze problems and as results some of them received wards in many competitions. The method to allot a portion to channel's WTP to genres is followed by the previous studies; that is, the relative importance of genres are expressed by the degree of importance or degree of realization (Nienstedt et al., 2012), or a gap between the degree of expectation and realization (BBC Trust, 2011). This paper also uses the degree of importance and degree of satisfaction in each genre. The degree of importance and degree of satisfaction are answered by respondents in terms of the five-point Likert scales. Equation (3) estimates relative importance of the genre by OLS and then the estimated coefficients β_1 are normalized for serving as ratio.

$$WTP_i = \beta_0 + \beta_1 Genre_j + \beta_2 X \quad (3)$$

where WTP_i denotes the WTP value of channel i , $Genre_j$ the answered importance and satisfaction of the j -th genre, and X_s the attributes of the s -th respondent such as gender, age, occupation, resident, size of regional population. In estimation, since the degree of importance and degree of satisfaction of ten genres are highly correlated, it causes the multicollinearity problem, if these all are included in the explanatory variables. Accordingly, only one genre is used for estimating equation (3) and one by one for

each genre is estimated. The results are shown in Table 4.

Table 4 Estimation Result

	General		Educational		BS1		BSP	
News and commentary	167.627	***	43.571	***	57.159	***	45.037	**
Sports	88.475	***	20.468		74.327	***	-5.394	
Life information	114.951	***	82.336	***	34.237*		72.124	***
Youth and education	-14.968		142.979	***	17.378		24.72	
Culture and welfare	38.407	*	131.542	***	18.95		51.077	***
Science and nature	80.551	***	80.772	***	20.502		59.966	***
Drama	69.940	***	48.247	***	22.121		40.865	***
Entertainment, music and traditional performing arts	86.735	***	71.984	***	15.917		52.628	***
Movies and animations	-7.602		89.589	***	26.976		17.718	
Large-scale projects	68.351	***	78.387	***	27.887	*	56.482	***

Note 1: the unit is JPY

Note 2: * p<0.1, ** p<0.05, and *** p<0.01

Since all estimated coefficients are not necessarily significant, the weights of genre consist of those with significant values, that is, those not significant are taken as zero. The weight of channel-genre matrix is shown in Table 5. Finally, the WTPs of product portfolio (channel-genre matrix) are indicated by Table 6. In this process of driving the value of product portfolio, only the WTPs of respondents' are considered and no value judgment is added. In this sense, the WTPs thus obtained is referred to as those based on the *general view* of viewers in comparison with consumer's or citizen's view, which will be discussed in what follows.

Table 5 Weight of channel-genre matrix

	General		Educational		BS1		BSP	
							%	
News and commentary	23.44		5.66		29.52		11.91	
Sports	12.37		0.00		38.39		0.00	
Life information	16.08		10.70		17.68		19.07	
Youth and education	0.00		18.58		0.00		0.00	

Culture and welfare	5.37	17.10	0.00	13.51
Science and nature	11.27	10.50	0.00	15.86
Drama	9.78	6.27	0.00	10.81
Entertainment, music and traditional performing arts	12.13	9.36	0.00	13.92
Movies and animations	0.00	11.64	0.00	0.00
Large-scale projects	9.56	10.19	14.40	14.94

Table 6 Value of product portfolio (channel-genre matrix)

	unit: JPY			
	General	Educational	BS1	BSP
News and commentary	309.37	23.42	197.37	70.62
Sports	163.24	0.00	256.64	0.00
Life information	212.15	44.25	118.21	113.10
Youth and education	0.00	76.84	0.00	0.00
Culture and welfare	70.88	70.70	0.00	80.09
Science and nature	148.66	43.41	0.00	94.04
Drama	129.08	25.93	0.00	64.08
Entertainment, music and traditional performing arts	160.08	38.69	0.00	82.53
Movies and animations	0.00	48.15	0.00	0.00
Large-scale projects	126.15	42.14	96.29	88.57

4.5 Observations

From Table 6, the following observations are derived; In terms of Channel, NHK General which is the representative to NHK has higher values to all genres, in particular News and commentary has the largest, followed by Life information, Sports, Entertainment, music and traditional performing arts, Science and nature, Drama, Large-scale project, and so on. On the other hand, since Youth and education, and movies and animations are mainly for younger generations and broadcasted in NHK Educational, their values are zero. Accordingly these have large values in NHK Educational.

News and commentary, and Sports in BS1 occupy the large amount of

broadcasting hours have large values, which is due to its programming to specialize international news and major sports including baseball, football and basketball in the US and European score. Whereas, BSP contains large-scale contents produced by the collaboration with foreign broadcasters or needed long-term preparation and coverage.

A closer examination on genre shows that News and commentary, and Sports are broadcasted by General and BS1, while Youth and Education is by Educational, and Science and nature, Drama, Entertainment, music and traditional performing arts, and Large-scale project are covered by General and BSP. These observations are the results of the developing process of BS1 and BSP which played the roles as the complement of terrestrial channels.

The following two remarks should be added to the above-mentioned observations: First, the above discussions are based on viewers' tastes and preferences and not on NHK's managerial decision, but they basically coincide with NHK's distribution of broadcasting hours and the amount of investment.⁵ A deeper analysis is, however, required to determine whether NHK's managerial decision making on these matters is consistent with viewers' evaluation. Second, the above analysis is based on *general view* of respondents, and while they relied to questions regarding WTP, their replies might be reflected by the mixture of private/public values, which is confirmed by the previous studies. In this sense, it is required to examine how much public or private value influences to their decision, that is, the decomposition of their WTP or the product portfolio into the public and private values. .

⁵ See, NHK's each year's annual report.

5. Analysis by Propensity Score Matching (PSM)

5.1 Propensity Score Matching

The analysis of the previous section successfully derives viewers' evaluation of programs in terms of WTP, but in this estimating process, no value judgment is added. From this reason it is from the viewpoint of and in particularly other past theoretical projection suggesting that if WTP is known the service can be handled in the same way as pay-TV was examined using the method known as PSM (Propensity Score Matching) with respect to the calculated WTP values. PSM is developed by Rosenbaum and Rubin (1983) and expanded by Heckman, et al. (1997, 1998b) and Heckman et al. (1998a), and applied in the evaluation of various fields such as environment (Hanemann, 1985), medicine (e.g. Akematsu and Tsuji (2012) and so on. In PSM, individuals possessing similar attributes are extracted from the two sample groups such as (1) preference for *consumer's view* and (2) preference for *citizen's view* on service, and compared the WTPs of product portfolio between these groups.

Using PSM, examination of the WTP values was carried out by dividing the sample population into two groups, the “consumer’s view group” and the “citizen’s view group.” The questionnaire has the 14 questions on public roles of NHK (Q25) asking to respondents whether NHK is expected to fulfill these roles in terms of the Likert four scales. The public roles includes (1) fairness and justice, (2) reporting right information at right speed, (3) providing opportunity for people to discuss, (4)

preservation, succession and collection of image records, (5) contributing to creating and developing culture, (6) programs with balanced genres, (7) creation of innovative programs, (8) transmitting Japanese information to the world, (9) contributing to rich and active community, (11) mindful broadcasting to the aged and disabled, (12) research and development of broadcasting technology, (13) activity to inform the reception fee system, (14) activity to enforce fair burden of the reception fees. Two groups are defined by the average scores of the above 14 questions. The group which has larger score than the average is termed by the group of the citizen's view, while the one with lower score than the average by the consumer's view. In other words, the former is based on public view, while the latter on market or private view. In what follows, this study aims to compare the WTP of these two groups. Care should be taken here for the difference in samples in the groups. Since the characteristics of the samples are different, the resulting WTPs are different. In this situation, it is difficult to decide how the difference is resulted by their views or their characteristics. A method which can verify the difference in WTPs is due to only that of their views by maintaining other characteristics exactly the same. PSM is the method to fulfill this. The standard procedure of PSM is as follows.

5.2 Identify biases contained

First, subjects in the citizen's view (treatment) and consumer's (control) groups are individually matched with one another so that their propensity scores as calculated according to their attributes become closer. The score is calculated by a probit analysis,

which is interpreted as the predicted probability of a probit estimation. The model consists of the user dummy as a dependent variable, while independent variables are those that have a sample selection bias, as shown in Table 7, which shows that biases exist in the variables such as Age, Profession: House wife, Living in Apartment, and Others.

Table 7 Test of selection biases by a probit analysis

Variable	Coef.	S. E.	z-value	p-value	
Age	0.007	0.003	2.54	0.011	**
Profession: worker	-0.066	0.134	-0.49	0.623	
Profession: professional	0.343	0.251	1.36	0.172	
Profession: part time job	-0.009	0.119	-0.07	0.942	
Profession: House wife	0.343	0.109	3.15	0.002	***
Profession: student	-0.098	0.179	-0.55	0.581	
Profession: No job	0.075	0.119	0.63	0.526	
Owned single house	0.066	0.121	0.55	0.585	
Living in Apartment	-0.286	0.159	-1.8	0.072	*
Married couple alone	-0.014	0.124	-0.12	0.907	
Married with children	-0.098	0.093	-1.05	0.293	
Others	-0.272	0.14	-1.94	0.053	*
Number of family	-0.038	0.031	-1.22	0.224	
Living in Kinki region	-0.088	0.103	-0.85	0.395	
constnt	0.18	0.239	0.75	0.452	
Number of observation	1398				
LR chi2(14)	69.59				
Prob. > chi2	0				
Log likelihood	-844.29				

Note: * p<0.1, ** p<0.05, and *** p<0.01

5.3 Matching to delete biases

Second, subjects in the treatment and control groups have to be matched based on propensity score. There are several ways of matching - caliper matching is generally

considered better than others, such as nearest neighbor matching, since it can exclude ‘bad’ matches. This paper utilizes caliper matching, in which a value for the maximum distance of predefined propensity scores is fixed at 0.0001, which the PSM literature describes as sufficiently small. The suitability of the matching can be examined by a balancing test, in which the explanatory variables listed above in the treatment and control groups are compared by a t-test - when a treatment does not meet its best-matched control, re-sampling by the bootstrapping method with 1000 replications is conducted. If there is no statistically significant difference, the matching is concluded. The result of balancing test is indicated in Table 8, in which all variables do not have significant difference, that is, the samples of two groups have exactly same characteristics except views toward public service broadcaster.

Table 8 Result of balancing test

Variable	Treated	Controls	% of bias	t-value	p-value
Age	55.72	55.89	-1.00	-0.21	0.835
Profession: worker	0.08	0.07	3.50	0.77	0.440
Profession: professional	0.02	0.02	-1.60	-0.32	0.747
Profession: part time job	0.11	0.12	-4.40	-0.91	0.362
Profession: House wife	0.19	0.18	3.10	0.61	0.539
Profession: student	0.03	0.04	-1.80	-0.49	0.626
Profession: No job	0.21	0.20	2.90	0.56	0.577
Owned single house	0.83	0.85	-4.90	-1.11	0.269
Living in Apartment	0.07	0.05	6.20	1.63	0.104
Married couple alone	0.25	0.23	4.90	0.99	0.323
Married with children	0.37	0.40	-6.10	-1.24	0.215
Others	0.08	0.08	1.00	0.22	0.825
Number of family	3.35	3.44	-6.10	-1.27	0.205
Living in Kinki region	0.13	0.12	3.50	0.76	0.445

5.4 Result of PSM

Finally, the effect of views on outcome variables, which in this paper are WTPs of product portfolio, is examined based on matched samples by a t-test (standard error estimation). In this section, the results are denoted separately in terms of channels and genres, since this way more clearly show the difference in comparison with Table 4. The results obtained are as shown in Table 9 for values of channels and Table 10 for those of genres, and the distribution of WTP into the genres is followed in the same manner as in Section 4. Table 9 shows that two groups have different values in General, BS1, and BSP before and after matching, while BS1 does not show the difference. Moreover, the treated group which represents the citizen's view has larger value of General, BS1, and BSP than the control group of the consumer's view, implying that three channels are considered to own more public values than market or private ones. The programs which Educational broadcasts have more or less public meaning, and then both of two groups consider the same values, which leads to the similar values and results in no difference among groups. Table 10 demonstrates that the citizen's view group shows larger values to five genres such as News and commentary, Sports, Culture and welfare, Science and nature, and Large-scale projects than the consumer's view group before and after matching.

Table 9 Result I: WTP of channels by PSM

Variable	Sample	Treated	Controls	Difference	S. E.	t-value	p-value	
General	Before matching	1162.99	939.67	223.32	48.79	4.58	0.000	***
	After matching	1162.99	1004.45	158.54	65.09	2.44	0.010	***
Educational	Before matching	384.01	358.18	25.83	27.74	0.93	0.350	
	After matching	384.01	331.79	52.22	36.78	1.42	0.160	
BS1	Before matching	567.50	488.06	79.44	26.16	3.04	0.000	***
	After matching	567.50	485.28	82.22	38.66	2.13	0.030	**
BSP	Before matching	511.85	422.58	89.27	23.70	3.77	0.000	***
	After matching	511.85	421.13	90.73	32.37	2.80	0.010	***

Table 10 Result II: WTP of genres by PSM

Variable	Sample	Treated	Controls	Difference	S. E.	t-value	p-value	
News and commentary	Before matching	770.25	619.80	150.45	36.69	4.10	0.000	***
	After matching	780.23	684.68	95.55	43.89	2.18	0.029	**
Sports	Before matching	295.98	191.47	104.52	18.30	5.71	0.000	***
	After matching	291.88	196.74	95.14	20.73	4.59	0.000	***
Life information	Before matching	244.93	227.85	17.08	20.31	0.84	0.401	
	After matching	251.24	240.17	11.07	26.58	0.42	0.675	
Youth and education	Before matching	185.50	185.02	0.48	17.30	0.03	0.976	
	After matching	186.63	189.17	-2.54	23.52	-0.11	0.912	
Culture and welfare	Before matching	377.64	249.84	127.80	22.48	5.69	0.000	***
	After matching	377.63	263.39	114.24	26.22	4.36	0.000	***
Science and nature	Before matching	193.02	141.76	51.26	15.70	3.26	0.001	***
	After matching	189.40	147.38	42.02	17.11	2.46	0.014	**
Drama	Before matching	64.53	53.85	10.68	8.13	1.31	0.190	
	After matching	64.08	58.05	6.03	9.83	0.61	0.542	
Entertainment, music and traditional performing arts	Before matching	89.49	106.14	-16.65	13.75	-1.21	0.226	
	After matching	94.49	85.21	9.28	18.64	0.50	0.617	
Movies and animations	Before matching	101.91	111.80	-9.89	12.90	-0.77	0.441	
	After matching	103.91	107.98	-4.08	18.39	-0.22	0.826	
Large-scale projects	Before matching	122.23	64.79	57.43	10.82	5.31	0.000	***
	After matching	120.36	65.06	55.30	10.71	5.16	0.000	***

Note 1: The unit of Treated, Controls, and Difference is JPY.

Note 2: * $p < 0.1$, ** $p < 0.05$, and *** $p < 0.01$

5.5 Comparison with the general view

The difference in values among two groups are identifies and here this result can compare with the values expressed by the general view examined in the previous sections, that is, this examines whether respondents' values revealed under the general

view is closer those of the citizen's or consumer's views. To understand clearly, the values of genres through the channels are compared. The values of the citizen's or consumer's views through the channels are obtained by Table 10, and those of the general view are calculated from Table 6. In comparison, since the total WTPs of the general view and those obtained by PSM are different, they cannot compare straightly, and thus values of genre have to be adjusted by normalizing the WTP of the general view, for example. In addition, the genres which have significant coefficients in Table 10 are compared. The values of the citizen's and consumer's view groups adjusted in this way are shown in Table 11. According Table 11, in New and commentary, Sports, Science and nature, and large-scale projects, the values of the citizen's view group clearly are larger than those of the consumer's view group, while that of Culture and welfare is in between two, and it is difficult to determine the difference. In sum, it can conclude that the respondents' evaluation of the genres is based on closer to the public views.

Table 11 Comparison of values by three views

	General view	Citizen's view		Consumer's view	
		Treated		Controls	
		Without adjustment	With adjustment	Without adjustment	With adjustment
News and commentary	600.78	780.23	602.34	684.68	330.70
Sports	419.88	291.88	225.33	196.74	95.03
Culture and welfare	191.67	377.63	291.53	263.39	127.21
Science and nature	286.11	189.40	123.06	147.38	71.18
Large-scale projects	353.15	120.36	92.92	65.06	31.42

6. Conclusion

In this study, aiming at the application of portfolio management to the public service broadcasting organizations, the actual data from Japan's public service broadcasting corporation, NHK, was used, and an examination employing methodology from econometrics and other sources was conducted.

The following conclusion is obtained; Firstly, emulating previous studies, having calculated the WTP values, the product portfolio was derived while taking into account the need to reflect public value by using PSM. As a result, this study was able to carry out a *mieruka* (visualization) in a form close to that performed for private businesses while reflecting the differences in contents between public and private broadcasters, which is necessary when examining WTP values for public service broadcasting organizations. It is believed that this study makes a contribution that expands on the work of previous research despite the limitations of not being able to examine other estimation methods and failing to incorporate innovations that have been discussed in academic circles in recent years.

In addition, it should also go without saying that portfolio management alone is insufficient and that other management environments are also important premises for the realization of objectives (Ratkovic-Njegovan et al., 2012).

Moreover, with respect to the difference in public service value and market value in certain genres, a matter that is frequently pointed out, concrete results are also obtained and serve as necessary inputs, such as cost effect and so on, for actual management situations. The direction of future study lies in the evaluation of costs and

benefits of product portfolio management in term of cost/benefits or cost effectiveness analysis. In so doing, more rigorous evaluation method is required. In this sense, while this study is limited to a birds-eye view of the whole problem, it can be said that this is a first step toward the contribution when considering portfolio management based on WTP.

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