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The value of public service broadcasting in Japan: The life satisfaction approach^{†‡}

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Abstract

Evaluation of amenities and benefits of public service broadcasting is crucially important with the accelerated convergence of broadcasting and telecommunications and the increasing heterogeneities of media use by individuals. With the use of the microdata provided from a survey carried out by Japanese public service broadcaster, we attempted to elucidate the effect of viewing public service broadcasting on individual well-being using the life satisfaction approach in quantitative, monetized terms. Crucial findings of our analysis include that viewing frequency of public service broadcasting is negatively associated with life satisfaction, even after successfully addressing the endogenous nature of television viewing. It is also found that the detrimental effect of viewing public service broadcasting has a considerable monetary impact. In the sense of studying the demand side, our exploration of the value of conventional viewing of public service broadcasts will provide a valuable comparative benchmark future research in this domain.

Keywords

Life satisfaction approach; Non-market valuation; Television viewing; Public service broadcasting

JEL Classification Numbers

D61, H41, I31, L82

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1. Introduction

In the accelerated convergence of broadcasting and telecommunications, public service broadcasters have challenging institutional and administrative tasks (Nakamura et al. 2012). Likewise in the environment surrounding Japanese public broadcasting, discussion on its revival and reform has been intense, and actual practical developments have been witnessed (Arai, 2006; Shimizu, 2006). For example, Japan Broadcasting Corporation (hereafter, NHK), the Japanese public service broadcaster, started video-on-demand services in 2008 following the Broadcast Act revised in 2007. Further, it has pursued a simultaneous distribution service on a trial basis since 2015, along with the second revision of the Act that year (although not always regularly). The development of ICT and competition and diversification in service provision have made the media use more active and personalized approaches in terms of what broadcasting contents people like to view, and how they like to view. Reflecting such movements in broadcasting in the context of sociocultural changes and consequent concerns regarding the future of public service broadcasting, discussion and assessment of reception fees has also been a hot issue (Sunada, 2012).

Motivated by the foregoing, the uniqueness and novelty of this study is that we elucidate the effect of public service broadcasting on individual well-being, and quantify viewers' evaluations of its value using the life satisfaction approach. The life satisfaction approach is an emerging technique for measuring the values of non-market goods. Willingness to pay is an effective indicator to examine and learn what contents and services viewers appraise and expect (Hausman, 1993; Pearce, 1993). Considering for example that advertising is legally prohibited in public service broadcasting in Japan, and reception fees constitute the majority of its revenue¹, willingness to pay is a useful evaluation method in terms of implicitly reflecting evaluations vis-à-vis the challenges and performance of public service broadcasters, notwithstanding possible biases and limitations regarding its measurement. On the other hand, it is valuable to utilize observable information on viewers' actual behavior and study the demand side in terms of viewers' perspectives. Viewers' benefits have become more diversified since there are increasing opportunities to enjoy video contents on various devices, in real-time or delayed depending on viewers' schedules and preferences, and with or without active and personalized features, again subject to viewers' preferences. In the sense of studying the demand side, exploring the value of conventional viewing of public service broadcasts from the demand side will provide a valuable comparative benchmark.

Empirical approaches exploring the effects of television viewing (or media

¹ For the FY 2016 budget, JPY 675.8 billion was predicted as reception fees, which accounted for 96.3% of the total business income (Nippon Hoso Kyokai, website)

consumption in general) on individual subjective well-being using the life satisfaction approach have been emerging mainly in Europe (Bruni and Stanca, 2008; Benesch et al., 2010; Bruni and Stanca, 2006, 2008; Cuñado et al. 2012; Frey et al., 2007; Frey and Benesch, 2008; Kataria and Regner, 2011). However, to the best of our knowledge, no empirical study has specifically dealt with the impact of viewing public service broadcasting on well-being. Considering the aforementioned context and trends surrounding public service broadcasting, we suggest that it is pertinent to apply this approach to a case-study thereof. Because public service broadcasting can be differentiated from private service counterparts in terms of program content domains, line-ups, and advertising (or lack thereof on public services), good reasons can be put forward not to conflate these service types in empirical research. Media has potentially multi-dimensional and multi-layered influences on the lives of individuals and society in a broad sense, thus evaluations are worth attempting in terms of informing public policy perspectives (Ichikawa et al., 2012).

In addition, we attempt to address an important model specification issue relevant to empirical analysis in this domain. Potential endogeneity of television viewing has been considered as a serious issue from econometric perspectives. Previous studies refer to the possibility of inverse causality and correlation of television viewing with unobservable factors (Frey et al., 2007; Frey 2008). We believe that working on this technical issue is important to accurately derive and evaluate the impact of viewing public service broadcasting.

The remainder of this paper is organized as follows. Section 2 is a summary of related literature. Section 3 explains our general approach and empirical strategy before Section 4 provides a detailed description of the data. Section 5 presents the results. Section 6 offers discussion and, finally, Section 7 is concluding remarks.

2. Related literature

2.1. Appraising non-market goods using the life satisfaction approach

Public service broadcasting is a non-market good where the price for viewing is a single flat fee imposed by regulation (at least in Japan), and the heterogeneity of viewers' preferences is thus not reflected in the price. Previous studies have employed the contingent valuation method to derive the willingness to pay for public service broadcasting so as to explore monetary evaluation of the value of service and its provision (Delaney and O'Toole, 2004; Ehrenberg and Mills, 1990; Finn et al., 2003; Lin et al., 2013; Onoe et al., 1993; Schwer and Daneshvary, 1995; Tsuji and Miyahara, 2007)². This is a powerful and widely used stated preference method, and is

² Anstine (2001) is a rare study which utilize the hedonic pricing approach to quantify the willingness to pay for

informative in that it can provide practical advice for defining and analyzing acceptable reception fees to viewers while developing future strategies for accountable and advantageous operation of public service broadcasting (Tsuji and Miyahara, 2007). Also, it may reflect an appraisal of qualitative aspects of television such as program composition, as well as reflecting viewers' perceptions regarding images and sentiments on television.

However, we attempt to use another method to quantify viewers' benefits from public service broadcasting. The life satisfaction approach is used for directly measuring the effects of consuming target goods on consumers' well-being by estimating a well-being function. Life satisfaction is used on the grounds of the experienced-utility approach (Kahneman et al., 1997; Kahneman and Sugden, 2005). Experienced utility is different to decision utility in that the former reflects hedonic responses to action and experience, whereas the latter represents preferences derived from choice (Kahneman et al., 1997). People's self-reported happiness and life satisfaction scores are regarded as a proxy for utility, and it is regressed on target non-market goods and other attributes³. Using the estimated coefficients of the target goods and income, monetary values of non-market goods are calculated by obtaining the marginal utility of the target goods and the marginal utility of income. This thus allows for capturing the trade-off ratio between the target goods and income. This approach to measurement is seen in the context of a variety of non-market or non-priced goods such as location-specific environmental amenities (Ferreira and Moro, 2010), aircraft noise nuisance (Van Praag and Baarsma, 2005), climate (Frijters and Van Praag, 1998; Maddison and Rehdanz 2011), air pollution (Luechinger, 2009; Welsch, 2002, 2006), sulfur emissions (Di Tella and MacCulloch, 2008), terrorism (Frey et al. 2009), flooding (Luechinger and Raschky, 2009), droughts (Carroll et al., 2009), forest fires (Kountouris and Remoundou, 2011), and nuclear accidents (Danzer and Danzer, 2011). Using the life satisfaction approach as we do, Kavetsos and Koutroumpis (2011) is a rare study attempting the monetary evaluation of consumption of media goods. They examined the influence of ownership of technical goods, not frequency of their use, on life satisfaction, and quantified its monetary impact. Data from the Eurobarometer covering 29 countries over 2005 to 2008 were used for the analysis. The results revealed that the ownership of television (the

subscription to cable network television. She modified the traditional method so as to make it applicable to goods in monopolistic or oligopolistic markets.

³ According to Nettle (2005), the notion of happiness is explained by three aspects: it is an instantaneous feeling such as joy and pleasure defined by positive or negative 'affect' in psychology; it is life satisfaction which reflects the global sense of satisfaction with overall life; it is quality of life expressed as "eudemonia" and "good life" obtained by enhancing and exercising personal potential capability. This perspective can imply that happiness and life satisfaction are synonymous. On the other hand, Frey and Stutzer (2002) provide a different perspective that life satisfaction is a person's personal relatively dispassionate evaluation on affluence and quality of life, whereas happiness is grounded in the state of life satisfaction but is also additionally influenced by emotion and affect toward personal circumstances. As far as we investigated, empirical studies on factors affecting subjective well-being represented by happiness or life satisfaction, particularly when focusing on the impact of media use and social communication on well-being, tended not to use these two indicators in line with each different (or common) notion.

number of television sets) and televisions with DVD devices were not statistically significant vis-à-vis life satisfaction, whereas other technical goods such as CD players, PCs, Internet connection, mobile phones, and fixed-line phones were positively significant. Their results suggested that a 10% increase in penetration of mobile phones and broadband services was equivalent to 2.36–2.89% of GDP per capita. They also discussed the surplus value of consumption of those goods by comparing the estimated monetary benefits with actual costs defined as the proportion of average annual reception fees of broadband services to GDP per capita.

2.2. Television viewing and life satisfaction

Empirical studies into the effect of media consumption on individual subjective well-being have been centered principally on Europe with the use of microdata from cross-country surveys such as the European Social Survey, Eurobarometer and World Value Survey (Bruni and Stanca, 2008; Benesch et al., 2010; Bruni and Stanca, 2006, 2008; Cuñado et al. 2012; Frey et al., 2007; Frey and Benesch, 2008; Kataria and Regner, 2011). Most of this literature has established negative relationships between television viewing frequency and well-being and justified such a relationship based on a supposition that the act of television viewing is an example behavior leading to individuals' imperfect self-control and erroneous forecasting of long-term costs that could result in causing his/her well-being to deteriorate (Benesch et al., 2010; Frey et al. 2007). This reflects a viewpoint on the short-term and long-term effects of television watching on individual utility. People watch television because the instant satisfaction of television viewing (amusement and relaxation as entertainment) is relatively high compared to other leisure activities, and its marginal cost is very low. However, people may appraise television less than other leisure goods and services because they recognize future costs such as lack of sleep, decline in social interaction, and underinvestment in labor and education (Robinson and Godbey, 1999; Frey et al. 2007). Frey et al. (2007), for example, worked on this point indirectly by comparing estimation results among sub-groups divided according to individuals' opportunity costs and by estimating the life satisfaction equation with individual attributes and preferences that were systematically related to overconsumption of television viewing⁴.

Another questionable issue as regard the negative impact of television viewing on life satisfaction is the inverse causality. It is conceivable that those who are dissatisfied with life tend to spend more time watching television, falling into the “self-enforcing circle” (Frey 2008). Also, unobservable factors may be correlated with television viewing. If television viewing is

⁴ Frey et al. (2007) did not attempt to explicitly measure time-inconsistent and hyperbolic discounting preferences, nor include these preferences in their empirical model for the purpose of examining the influence of television viewing on such preferences.

treated as exogenous without assessing or ameliorating its endogenous nature, its estimator will be biased⁵. Aforementioned arguments that see television viewing as a habitual behavior induced from the absence of self-control that results in yielding future costs should be examined after addressing endogeneity issues. Bruni and Stanca (2008) worked on this point, and studied the effect of relational goods (such as social activities and connectedness with social groups and organizations) on life satisfaction. They found that time spent on relational activities impacted positively on life satisfaction, and in turn television viewing had a negative effect on time spent on relational activities. With these two pieces of evidence, they concluded that television viewing would crowd-out relational goods, resulting in deterioration of life satisfaction. They used respondents' self-reported importance of television as an entertainment tool as the instrument for television viewing to examine the causality between time spent on relational activities and time spent on television viewing. Estimation results revealed endogeneity of television viewing, but it depended on type of relational goods. They examined the relation between life satisfaction and relational goods and the relation between relational goods and television viewing in separately, in two regressions, and therefore the relation between life satisfaction and television viewing was not investigated directly. Using the same data, a cross-country sample from the World Value Survey, Kataria and Regner (2011) investigated the validity of the results in Bruni and Stanca (2008) by treating life satisfaction as the dependent variable and relational goods and television viewing as independent variables, all together in one regression specification. The results in Bruni and Stanca (2008) were not supported. Indeed, Kataria and Regner (2011) concluded that television viewing positively affected life satisfaction, that the difference in viewing hours was not observed, and that most of the variables representing relational goods did not have explanatory power vis-à-vis life satisfaction. Also, they found that television viewing did not have explanatory power on life satisfaction when using a subset restricted to European data, and thus region- or country- specific heterogeneities should be considered for examination⁶.

The endogeneity issue is a concern for other media and information goods. Pénard et al. (2013) used family internet use as the instrument for individual internet use in studying its effect on life satisfaction. They claimed that this instrument was valid in terms of intra-household spillover to affect individuals' propensity to use the internet and to disassociate with his/her life satisfaction. They confirmed the validity of the instrument and corroborated a

⁵ Kavetsos & Koutroumpis (2011) pointed out, however, that causality identification should be considered only when using the frequency of use and viewership of information goods (including television) as a determinant factor of well-being, and such issue may not be a concern when using the ownership of the goods (number of television sets, PCs, etc).

⁶ It is noted that subjective well-being is heavily determined by geographically specific cultural factors, and thus incentives for improving well-being should be considered from sociocultural perspectives (Uchida et al. 2004). In this sense, regional differences and socio-culturally determined television viewing behaviors are pertinent to consider. .

significant positive influence of the intensity of online use on life satisfaction and no significant influence on happiness.

3. Empirical strategy

3.1. Endogeneity problem of television viewing

Previous studies have noted a causality issue with the relationship between television viewing and life satisfaction; namely, those who are unsatisfied with life tend to spend more time watching television (Frey 2008). Also, media consumption including television viewing is correlated with and determined by unobservable factors which also influence life satisfaction (Frey et al., 2007). It can be argued that television viewing frequency and unobserved factors affecting life satisfaction are positively correlated. Suppose that an inquisitive personality is an unobserved factor. Inquisitive individuals are more likely to utilize media as sources for information and knowledge they want to obtain and learn, thereby resulting in watching television more. At the same time, these inquisitive individuals are considered to have a fulfilling life. In this case, television viewing frequency is not exogenous, and the effect of television viewing on life satisfaction is overestimated if we treat the variable of television viewing as exogenous in the estimation of life satisfaction. In contrast, a negative correlation between television viewing frequency and unobserved factors affecting life satisfaction is another possibility. When a sociable and extroverted personality is considered as an unobserved factor, it is conceivable that sociable and extroverted individuals are likely to spend more time engaging in social interaction and thereby less time watching television. They are also considered to be satisfied with life. In such a case, again, television viewing frequency is also not exogenous, and the effect of television viewing on life satisfaction is underestimated if we treat the variable of television viewing as exogenous in the estimation of life satisfaction.

To deal with the potential endogeneity of television viewing, we employ the instrumental variable method. We treat viewing frequency of public service broadcasting tv_i as having an endogenous nature, and thus estimate a reduced form equation as the first stage (Equation 1).

$$tv_i = \omega + \varphi Z_i + \mathbf{X}_i \rho + \varepsilon_i \quad (1)$$

tv_i is the viewing frequency of public service broadcasting, and Z_i is the instrument for viewing frequency. \mathbf{X}_i is a vector of respondents' exogenous characteristics including gender, age, employment status, number of family members, and size of residential area. ε_i is the unobservable element affecting the corresponding dependent variable. Our instrument is the

expenditure on cultural and recreational services of households living in the same proximity. It is considered that there is a local spillover whereby consumption of cultural and recreational services by neighboring households in residential areas has an effect on individuals' propensity to spend on services and activities for culture, entertainment, and recreation instead of watching television. We believe that expenditure on cultural and recreational services by households living in the same proximity is valid as an instrument because it is negatively correlated with television viewing frequency, but not with unobserved factors such as inquisitive personality or sociable and extroverted personality.

We substitute the estimated value of viewing frequency of public service broadcasting obtained in the first stage as the independent variable for estimating the life satisfaction equation in the second stage. Life satisfaction is explained according to Equation 2.

$$W_i = \alpha + \beta tv_i + \delta y_i + \mathbf{X}_i \gamma + \mu_i \quad (2)$$

where W_i is i 's life satisfaction measured by ordinal choices; y_i is household income; and \mathbf{X}_i is a vector of respondents' characteristics that was also included in Equation (1). μ_i is the usual error term affecting life satisfaction. The effect of household income is expected to be positive. The effect of viewing frequency of public service broadcasting can be positive or negative. The recent literature has witnessed an increase in the number of studies that explore the negative relationship between individuals' well-being (happiness or life satisfaction) and television viewing. However, this relationship may not be observed when public service broadcasting is specifically focused on. Studies also suggest that this relationship is inverse when different informational goods are targeted. We attempt to strictly corroborate what effect television viewing has on life satisfaction, focusing on public service broadcasting and addressing the potential endogeneity of television viewing.

We use the two-stage least squares method for estimating Equation (1) and (2). We employed OLS for both the first and second stages of the estimation. Alternatively, given the truncated nature of the dependent variable in the first stage, we could have opted for a tobit modeling approach, rather than OLS, while the hierarchical nature of the dependent variable in the second stage would have permitted the use of an ordered probit or ordered logit model. However, we still adopted OLS to save the time for the adjustment of the error terms and particularly to gauge the monetary values of viewing public service broadcasting using the estimated coefficients.

3.2. Appraising public service broadcast viewing

Using estimated life satisfaction (Equation 2), we calculate the shadow price Δy_i , needed to

compensate for the change of Δtv_i . When viewing frequency of public service broadcasting changes from tv_{i0} to tv_{i1} , to hold the utility constant, it is necessary to adjust income from the initial income corresponding to the change in utility (proxied by life satisfaction) induced by the increase in viewing frequency. Hence, the equality in Equation 3 should be satisfied.

$$W_i(y_{i0} + \Delta y_i, tv_{i0} + \Delta tv_i, \mathbf{X}) = W_i(y_{i0}, tv_{i0}, \mathbf{X}) \quad (3)$$

Dropping all irrelevant variables, this resolves down to Equation 4.

$$\delta(y_{i0} + \Delta y_i) + \beta(tv_{i0} + \Delta tv_i) = \delta y_{i0} + \beta tv_{i0}$$

or

$$\delta \Delta y_i = -\beta \Delta tv_i \quad (4)$$

where δ and β are given by estimating Equation (2), Equation (4) may be rewritten as Equation 5.

$$\Delta y_i = -(\beta/\delta) * \Delta tv_i \quad (5)$$

Equation (5) yields the monetary compensation for the change of viewing frequency of public service broadcasting, holding the level of life satisfaction fixed. Needless to say, Equation (4) is of course rewritten as $\Delta y_i/\Delta tv_i = -\beta/\delta$, and it represents the trade-off ratio between the viewing frequency of public service broadcasting and household income. The compensation depends on the initial income since it is the relative changes between these two factors, and the adjusted amount is added to or subtracted from the initial income, holding the utility fixed.

4. Data

4.1. Original survey and distribution of key sample characteristics

The data used in the analysis are microdata provided from a survey carried out by NHK (*Nippon Hoso Kyokai*) every six months. Two-stage random sampling stratified by regional block and population size was employed, and approximately 3,600 different males and females aged over sixteen living in Japan were targeted each time; thus, these are pooled cross-sectional data, not panel data. Both face-to-face interview and placement (self-administered) methods were implemented. The number of valid responses at each survey interval was approximately 2,000

which accounted for over 50% of those surveyed⁷). We used five sets of cross-sectional data collected from the surveys between 2013 to the first half of 2015 (namely, January and July in 2013, January and July in 2014, and January in 2015), and appended them as pooled data.

Respondents reported their overall satisfaction with life by answering the question “Overall, how satisfied are you with your life these days?” on a range from 0 (not satisfied at all) to 10 (very satisfied). We regarded overall life satisfaction as reflecting multi-dimensional socioeconomic and psychological situations of individuals. Mean scores and distribution shapes are almost identical in each survey period (Figure 1). Although mean scores range approximately between 6.2 to 6.4, modal scores were 5, 7 or 8. Tendencies of Japanese people to score at the midpoint vis-à-vis subjective assessments and preferences have been noted elsewhere (Chen et al., 1995; Lee et al., 2002; Minkov, 2009).

Respondents were also interviewed on their television viewing habits. Respondents were asked to specify weekday viewing hours of programs broadcasted by NHK, including both terrestrial and satellite, among categories in increments of one hour. We use this information for representing viewing frequency of public service broadcasting. Over half of respondents watched NHK programs for less than 2 hours on week days, and about 30% of them did not watch them at all. Such patterns were distinctive especially among younger people and those in employment (Figure 2).

[Figure 1 is inserted here]

[Figure 2 is inserted here]

4.2. Data of the instrument for television viewing

We address the potential endogeneity of television viewing frequency by employing the instrumental variable method. Our instrument is monthly household expenditure on cultural and recreational services per household over prefecture which is available from the Family Income and Expenditure Survey. It contains lesson fees for hobbies and cultural activities, admission fees and membership fees for movies, plays, sports events and cultural facilities, and travel expenses. We added the monthly expenditures for the last six months of each survey, calculated the average value, and used its proportion to total consumption expenditure. For the following empirical analysis, we matched the data on monthly household expenditure on cultural and recreational services with responses in the original survey data. Figure 3 plots average viewing hours over categorized household expenditure on cultural and recreational services. We can

⁷ The response rates for the surveys using the interview method were 59.4%, 57.0%, 57.9%, 56.0%, and 55.8% in the order of first to last survey rounds, and the response rates for the surveys using the placement method were 55.8%, 53.6%, 53.3%, 51.2%, and 51.8%.

observe a moderate negative correlation. Figure 4 also displays the average proportion of household cultural and recreational expenditure over life satisfaction scores. It seems that these variables are not correlated with each other. These plots can provide crude evidence to some extent about the eligibility of using such proportion of household expenditure as an instrument for viewing hours.

[Figure 3 is inserted here]

[Figure 4 is inserted here]

5. Results

5.1. Effect of television viewing on life satisfaction

Descriptive statistics of variables used in the analyses are shown in Table 1; and the results for the two-stage least squares estimation for life satisfaction are presented in Table 2. The first stage of the estimation shows that monthly household expenditure on cultural and recreational services is negative at the 1% significance level. Although high statistical significance does not necessarily confirm the validity as an instrumental variable in terms of issues on weak instruments (Staiger and Stock, 1997), the first stage F-statistics for testing the relevance of the excluded exogenous variables are large and thus we can ignore the weak instrument problem. Endogeneity tests also show that the null hypothesis of the exogenous nature of viewing hours of NHK programs is rejected at the 1% significance level, suggesting endogeneity of viewing hours of NHK programs. It is impossible to perform tests of over-identifying restrictions since the number of instruments is equal to the number of endogenous regressors. However, the correlation coefficient between the instrument and the residual is very low (-0.0036). Considering the results of these statistical tests, our instrument is deemed to be valid in this context.

The second stage results suggest that weekday viewing hours of NHK programs after instrumented is negative on life satisfaction at the 5% significance level. This thus indicates that those who watch NHK programs longer on week days tend to report lower levels of life satisfaction. Compared with the results estimated by OLS as shown in Table 3, the coefficient here goes down notably and takes a negative value as a result of addressing the endogeneity of television viewing. This suggests that there was an upward bias when treating viewing hours as exogenous. Household income is significantly positive as hypothesized, meaning life satisfaction improves with increasing income. Further, life satisfaction is associated with several individual characteristics. It tends to be higher among females, non-workers, and those with fewer family members. Also, life satisfaction is a quadratic U-shaped function of age registering

a minimum at 38 years old according to the value and sign of coefficients.

[Table 1 is inserted here]

[Table 2 is inserted here]

[Table 3 is inserted here]

The effect of viewing public service broadcasting varies depending on which aspects of satisfaction are taken into account. Respondents were asked to state their satisfaction in various domains of life in the survey as well as satisfaction with life overall, all via 10-point scales. Specifically, they scored their satisfaction in terms of the following aspects: health condition, achievement in life, safety and security in living, role in communities, safety and security in future life, time spent on favorite things, residential neighborhood, financial situation, current job, relationship to spouse, relationship to family except spouse. Table 4 shows that viewing hours of NHK programs is negatively associated with satisfaction with health condition, achievement in life, safety and security in living, residential neighborhood, financial situation, relationship to spouse, and relationship to family except spouse. However, statistical tests cannot reject the hypothesis that viewing frequency is exogenous when considering satisfaction with role in communities, safety and security in future life, time spent on favorite things, and current job. These results remind us of the interpretation of negative effect of television viewing on life satisfaction discussed in previous studies, and allow us to share it to some extent.

[Table 4 is inserted here]

5.2. Monetary impact of television viewing

Taking advantage of coefficients of viewing hours of NHK programs and household income in the estimated life satisfaction equation, we quantified the monetary value that would compensate for changes in viewing hours of NHK programs. We find that individuals with an average annual household income of JPY 5,527,240 (USD 56,619)⁸ would have to be compensated with approximately JPY 894,700 (USD 9,165) for a one hour increase in weekday viewing of NHK programs, holding the level of life satisfaction fixed. To put it another way, the deterioration in life satisfaction because of a one hour increase in weekday viewing of NHK programs is equivalent to a monetary cost of JPY894,700. For reference, this is equivalent to what a person with an hourly wage of JPY3,580 could earn annually if he/she worked instead of watching NHK programs for one hour (JPY3,580 per hour×1 hour per day×5 days per

⁸ For conversion to US dollars, we use the average monthly mid-point of the foreign exchange rate for 2013 (USD/JPY = 97.62), obtained and calculated by OANDA (<https://www.oanda.com/lang/ja/currency/converter/>).

week×50 weeks per year=JPY895,000). The trade-off ratio between viewing hours and household income is 0.162, and monetary compensation at each household income class for a one hour increase in viewing is shown in Table 5. The compensation reflects the relative changes between viewing hours and household income, which thus depends on the initial income.

[Table 5 is inserted here]

As demonstrated in the previous subsection, the effect of viewing public service broadcasting varies depending on which aspects of satisfaction are taken into account. Monetary values of viewing public service broadcasting by those aspects of satisfaction are shown in Table 6; their amounts are relative large in terms of satisfaction with residential neighborhood and relationship with family (spouse and other family members). Presumably, television viewing may be more influential to the sense of contentedness in personal interaction with family and people living in proximity, compared to the sense of contentedness in living and economic stability.

[Table 6 is inserted here]

6. Discussion

Viewing frequency of public service broadcasting is negatively associated with individual sense of well-being, and its appraised monetary value is too large to be ignored. We additionally investigated the factors correlating to the income compensation; factors such as employment status (being a worker, executive, professional, and self-employed), number of family members and living in a large populated city have positive explanatory power (see Appendix 1). It seems that the income required to compensate for degraded life satisfaction because of increased viewing hours of public broadcasting tends to be higher among those who have higher opportunity costs, choice and opportunities to access alternative local amenities and leisure (by living in a large city), and large family size probably linked to household financial capacity. As far as time spent consuming is concerned, more frequent televising viewing does not contribute to increased life satisfaction, even if public service broadcasting programs are targeted.

However, public service broadcasters do not simply and automatically operate to contribute to people's well-being in the first place, and they have to meet organizational objectives under challenging conditions to achieve multiple public purposes. In this sense, another method such as the contingent valuation method to extract willingness to pay for

television itself has been considered valuable. As far as we investigated, willingness to pay for NHK programs, both terrestrial and satellite broadcasting services, tends to be higher among people who: spend longer viewing NHK programs, are middle-aged, and live in smaller cities (Appendix 2). This suggests a possibility that those who watch more television tend to be familiar with programs and tend to have more information and knowledge about broadcasted content. Such disposition of perceptions and attitudes may work positively so that such people would agree to pay higher fees.

It is uninformative to simply compare the factors affecting income compensation and willingness to pay since their measurement methods are completely different. Nevertheless, such studies may offer some points for discussion about the evaluation of public service broadcasting. It is necessary to increase viewing frequency to raise willingness to pay, but excessive increases in viewing frequency may have a detrimental effect on life satisfaction and require more income to be compensated for that. Accordingly, uniform charges for viewing public service broadcasting may be agreeable to those with longer viewing and higher willingness to pay, but unacceptable to those with shorter viewing and higher income compensation.

7. Conclusion

With the accelerated convergence of broadcasting and telecommunications and the increasing heterogeneities of media use by individuals, evaluation of amenities and benefits of public service broadcasting is crucially important in terms of quantifying the nature of non-market public goods. We attempted to elucidate the effect of viewing public service broadcasting on individual well-being using the life satisfaction approach in quantitative, monetized terms. In aiming to examine this effect precisely in an econometric sense, we particularly addressed the potential endogeneity of television viewing. The findings show that viewing frequency of public service broadcasting is negatively associated with life satisfaction, even after successfully addressing the endogenous nature of television viewing. It is also found that the detrimental effect of viewing public service broadcasting is worth approximately JPY 894,700 per year in the framework of our analysis. As far as viewing frequency is concerned, television viewing may undermine satisfaction and fulfillment in everyday life. There are logical reasons why television viewing may not contribute positively to life satisfaction, when compared to alternative ways of spending free time (for leisure). Or, comforts and benefits once gained from enjoying programs in a conventional televisual manner may now be degraded since personal access to and functionalities of media use have become more diversified.

However, our analysis is not without limitations. First, we need to explore the

relationship between life satisfaction and other aspects of actual viewing behavior, such as what kind of programs and channels people watch. Viewers' purposes and rationales for media use are varied, such as obtaining information for daily life, keeping up with current affairs, enjoying culture and entertainment and so on. There are differences in content provided and their organization between public service broadcasting and private commercial broadcasting. By reflecting on the distinctive features of public service broadcasting in empirical analysis by focusing on its qualitative characteristics, the effect of viewing public service broadcasting on people's life satisfaction will be further clarified. In addition, information such as weekend television viewing frequency and the usage of other media are important information regarding actual viewing behavior. Second, it is important to consider people's patterns, habits and daily routines as well as their preferences. These elements can be related to both television viewing and life satisfaction, and omitting such elements may cause biased estimator issues. These limitations are attributed to the nature of our cross-sectional data and, nevertheless, we suggest that our study offers important and interesting results as well as providing a platform for discussion and future research in this domain.

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Figure 1. The distribution of life satisfaction scores in the five survey sample periods

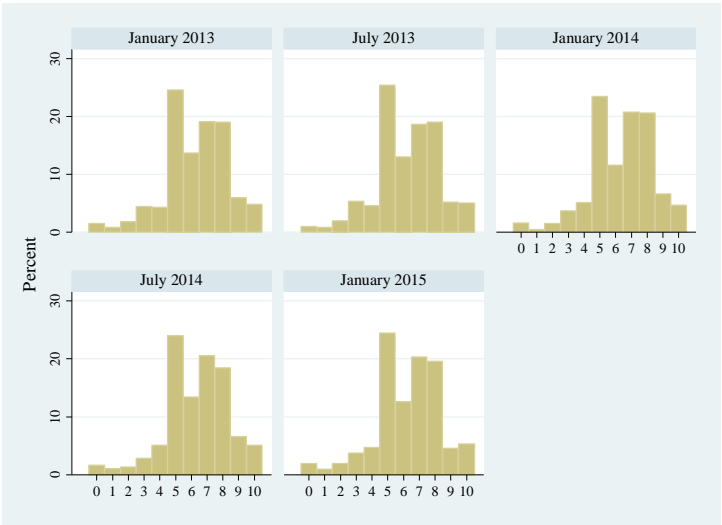


Figure 2. The distribution of viewing hours of NHK programs in the five survey sample periods

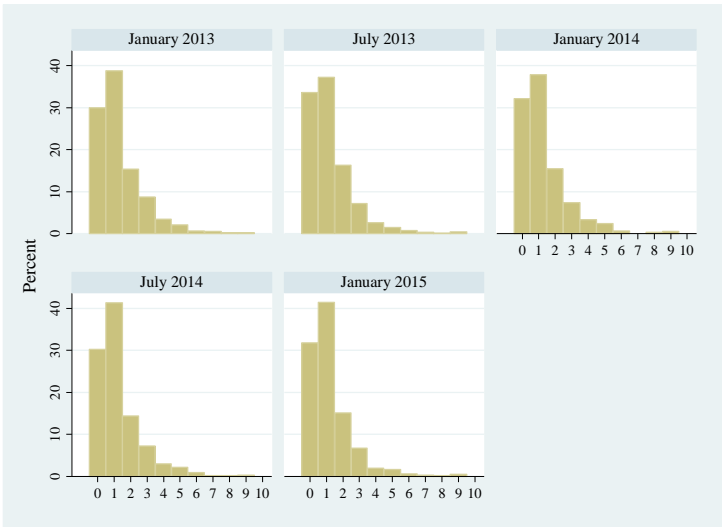
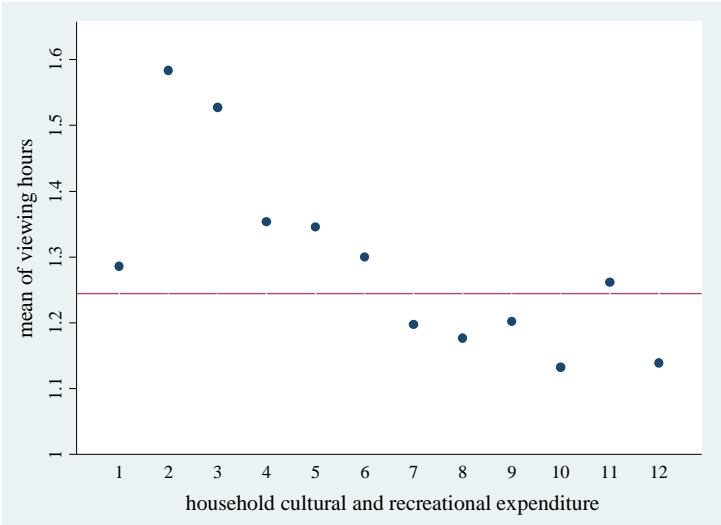
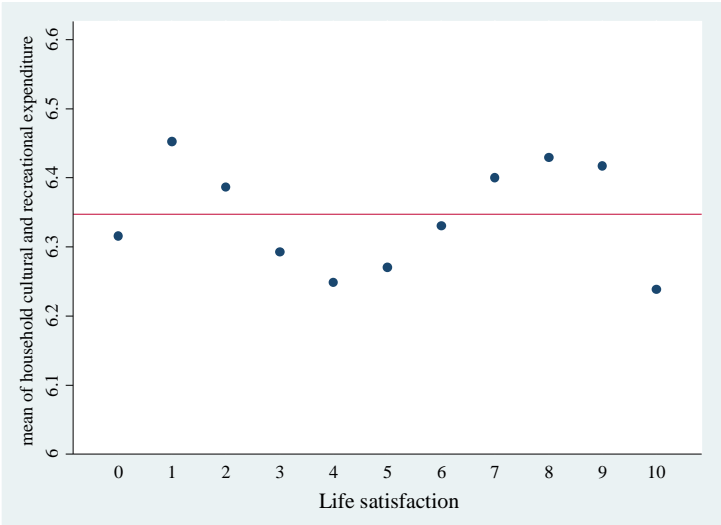


Figure 3. Viewing hours and household expenditure on cultural and recreational services



Notes: Viewing hours are shown in mean values, while household expenditures are shown as categorized groups.

Figure 4. Life satisfaction and household expenditure on cultural and recreational services



Notes: Expenditures are shown in mean values, while life satisfaction are shown as raw scores.

Table 1. Descriptive statistics

	Mean	Std.Dev.	Min	Max
Household income	552.724	363.913	100	2000
Household income (ln)	6.093	0.711	4.615	7.601
Sex (female=1)	0.454	0.498	0	1
Age	53.815	17.473	16	98
Being a worker	0.591	0.492	0	1
Number of family member	3.243	1.445	1	7
Living in a large city	0.244	0.429	0	1
Life satisfaction	6.311	1.966	0	10
Viewing hours of NHK	1.245	1.366	0	9
% of household expenditure on cultural and recreational services	6.347	1.013	3.416	9.067

Table 2. Life satisfaction estimation results (IV estimation)

	First stage
Expenditure on recreational services	-0.7414 *** (0.1393)
Adjusted R-squared	0.2326
F-value (1,7354)	28.331
	Second stage
Viewing hours of NHK	-0.0797 ** (0.0385)
Household income (ln)	0.4921 *** (0.0333)
Sex	-0.4451 *** (0.0622)
Age	-0.0770 *** (0.0112)
Age-squared	0.0010 *** (0.0002)
Being a worker	-0.3441 *** (0.1315)
Number of family member	-0.0599 *** (0.0229)
Living in a large city	0.0302 (0.0617)
Constant	5.8702 *** (0.4110)
Region	Yes
Survey wave	Yes
Observations	7365
Wald chi2	322.98
Tests of endogeneity	
Dubrin chi-squared test	7.4376 ***
Wu-Hausman F test	6.7758 ***

Notes: Sampling weights are used. Robust standard errors are in parentheses.
Independent variables employed in the second stage are included in the first stage as
exogenous regressors. * p<0.1; ** p<0.05; *** p<0.01.

Table 3. Life satisfaction estimation results (IV vs. OLS vs. Ordered probit)

	IV	OLS	Order probit	$\beta_{IV} - \beta_{OLS}$
Viewing hours of NHK	-0.0797 ** (0.0385)	0.0101 *** (0.0021)	0.0056 *** (0.0011)	-0.0898
Household income (ln)	0.4921 *** (0.0333)	0.4609 *** (0.0269)	0.2426 *** (0.0143)	0.0312
Sex	-0.4451 *** (0.0622)	-0.3733 *** (0.0483)	-0.1991 *** (0.0260)	-0.0718
Age	-0.0770 *** (0.0112)	-0.0629 *** (0.0082)	-0.0344 *** (0.0045)	-0.0141
Age-squared	0.0010 *** (0.0002)	0.0006 *** (0.0001)	0.0003 *** (0.0000)	0.0004
Being a worker	-0.3441 *** (0.1315)	-0.0739 (0.0574)	-0.0492 (0.0310)	-0.2702
Number of family member	-0.0599 *** (0.0229)	-0.0364 ** (0.0180)	-0.0204 ** (0.0097)	-0.0235
Living in a large city	0.0302 (0.0617)	0.0423 (0.0544)	0.0227 (0.0292)	-0.0121
Constant	5.8702 *** (0.4110)	5.2040 *** (0.2500)		0.6662
Region	Yes	Yes	Yes	
Survey wave	Yes	Yes	Yes	
Observations	7365	7365	7365	
Wald chi2	322.98		426.98	
R-squared		0.0756		
Pseudo R-squared			0.0193	

Notes: Sampling weights are used. Coefficients are shown for the ordered probit model instead of marginal effects. Robust standard errors are in parentheses. Independent variables employed in the second stage are included in the first stage as exogenous regressors. * p<0.1; ** p<0.05; *** p<0.01.

Table 4. Effect of television viewing on satisfaction with specific domains in life (IV estimation)

	Health condition	Achievement in life	Safety and security in living	Role in communities	Safety and security in future life	Time spent on favorite things
First stage						
Expenditure on recreational	-0.7519 *** (0.1391)	-0.7548 *** (0.1390)	-0.7498 *** (0.1391)	-0.7469 *** (0.1394)	-0.7553 *** (0.1388)	-0.7484 *** (0.1390)
Adjusted R-squared	0.2332	0.2345	0.2329	0.2322	0.2355	0.2327
F-value	29.2393	29.4817	29.0646	28.7038	29.5957	28.9797
Second stage						
Viewing hours of NHK	-0.0901 ** (0.0415)	-0.0700 * (0.0390)	-0.0665 * (0.0403)	0.0047 (0.0358)	-0.0018 (0.0387)	0.0074 (0.0435)
Household income (ln)	0.4619 *** (0.0369)	0.4234 *** (0.0335)	0.4913 *** (0.0349)	0.3315 *** (0.0291)	0.3759 *** (0.0326)	0.3297 *** (0.0339)
Observations	7453	7418	7438	7420	7427	7443
Wald chi2	345.93	300.68	331.70	248.73	356.91	534.15
Tests of endogeneity						
Dubrin chi-squared test	7.0875 ***	5.2797 **	4.6558 **	0.0083	0.0833	0.0009
Wu-Hausman F test	6.5182 **	4.7014 **	4.1074 **	0.0074	0.0755	0.0008
	Residential neighborhood	Financial situation	Current job	Relationship to spouse	Relationship to family (except spouse)	
First stage						
Expenditure on recreational	-0.7493 *** (0.1391)	-0.7556 *** (0.1392)	-0.5901 *** (0.1457)	-0.7458 *** (0.1617)	-0.7272 *** (0.1450)	
Adjusted R-squared	0.2330	0.2326	0.2306	0.2337	0.2277	
F-value	29.0328	29.4699	16.4049	21.2805	25.1464	
Second stage						
Viewing hours of NHK	-0.1317 *** (0.0468)	-0.1096 ** (0.0474)	0.0068 (0.0627)	-0.1162 ** (0.0545)	-0.0804 * (0.0454)	
Household income (ln)	0.3321 *** (0.0402)	0.7213 *** (0.0426)	0.6100 *** (0.0505)	0.5363 *** (0.0513)	0.3903 *** (0.0419)	
Observations	7447	7436	5588	5764	6736	
Wald chi2	154.50	491.84	322.08	130.15	122.73	
Tests of endogeneity						
Dubrin chi-squared test	14.4586 ***	9.1677 ***	9.8E-09	7.7295 ***	4.6809 **	
Wu-Hausman F test	12.7691 ***	8.1605 ***	8.7E-09	7.0587 ***	4.2048 **	

Notes: Sampling weights are used. Robust standard errors are in parentheses. Sex, age, age-squared, being a worker, number of family members, and living in a large city are included as independent variables in the second stage. These independent variables are also included in the first stage as exogenous regressors. * p<0.1; ** p<0.05; *** p<0.01.

Table 5. Monetary compensation by household income class

Household income (JPY thousand)	Compensation (JPY thousand)
4000	647.51
5000	809.39
6000	971.27
7000	1133.14
8000	1295.02
9000	1456.90
10000	1618.78
11000	1780.65

Table 6. Monetary compensation by aspects of satisfaction

Aspects of satisfaction	IC (JPY thousand)
Health condition	1078.5 †
Achievement in life	913.8 †
Safety and security in living	748.2 †
Role in communities	-78.3
Safety and security in future life	26.0
Time spent on favorite things	-124.8
Residential neighborhood	2191.1 †
Financial situation	839.6 †
Current job	-62.0
Relationship to spouse	1197.4 †
Relationship to family except spouse.	1139.0 †

Notes: † indicates that both coefficients of television viewing and household income in the 2sls second stage estimation are statistically significant.

Appendix 1 Determinants of income compensation (OLS)

	Full model	Selected model
Viewing hours of NHK	-0.3137 (0.3788)	
Sex	1.7091 * (1.0348)	1.7335 * (1.0343)
Age	0.4708 ** (0.1882)	0.4747 ** (0.1880)
Age-squared	-0.0067 *** (0.0018)	-0.0068 *** (0.0018)
Being a worker	10.1930 *** (1.2800)	10.3091 *** (1.2658)
Executive	40.0415 *** (4.3845)	40.0081 *** (4.3887)
Professional	17.9467 *** (6.0118)	17.9084 *** (6.0043)
Number of family member	8.1282 *** (0.4116)	8.1350 *** (0.4117)
Living in a large city	7.6833 *** (1.2529)	7.6874 *** (1.2532)
Access to broadcasting satellite	12.9147 *** (1.0120)	12.8249 *** (1.0069)
Household income		
Constant	14.8202 *** (4.8974)	14.7221 *** (4.8671)
Region	Yes	Yes
Survey wave	Yes	Yes
Observations	7075	7075
R-squared	0.1994	0.1993
AIC	72146.23	72143.27

Notes: Sampling weights are used. Robust standard errors are in parentheses. * p<0.1; ** p<0.05; *** p<0.01.

Appendix 2 Determinants of willingness to pay (OLS)

	Terrestrial		Satellite	
	Full model	Selected model	Full model	Selected model
Viewing hours of NHK	159.8774 *** (10.6679)	160.1860 *** (10.6659)	91.4085 *** (7.5595)	91.8852 *** (7.5458)
Sex	33.0991 (23.4935)	32.9010 (23.4669)	51.9247 *** (16.6362)	51.0259 *** (16.3351)
Age	-16.7976 *** (4.4203)	-16.7777 *** (4.4233)	-6.9081 ** (3.0586)	-7.4652 *** (2.8567)
Age-squared	0.2510 *** (0.0445)	0.2516 *** (0.0445)	0.0752 ** (0.0303)	0.0819 *** (0.0275)
Being a worker	43.5002 (28.1866)	43.2939 (27.9475)	-14.1958 (20.8378)	
Executive	119.0693 (75.8923)	120.7060 (75.7396)	108.2248 ** (53.4849)	101.9053 * (52.9970)
Professional	-36.9713 (104.5871)		93.9025 (78.6697)	
Number of family member	-4.3946 (8.8754)		-10.5095 * (6.1920)	-10.4085 * (6.1906)
Living in a large city	-48.7860 * (27.1651)	-47.6998 * (27.0168)	-56.6347 *** (18.5635)	-56.0435 *** (18.5562)
Access to broadcasting satellite	216.7185 *** (24.2094)	215.4932 *** (24.1151)	425.8489 *** (16.5278)	426.6375 *** (16.5040)
Household income	70.0091 *** (11.0457)	68.4322 *** (10.5848)	28.7037 *** (8.0953)	28.2413 *** (8.0875)
Constant	535.8179 *** (113.9115)	531.5566 *** (113.3328)	189.6145 ** (80.4205)	192.8956 ** (79.8183)
Region	Yes	Yes	Yes	Yes
Survey wave	Yes	Yes	Yes	Yes
Observations	7075	7075	7075	7075
R-squared	0.1320	0.1319	0.1498	0.1495
AIC	116604.60	116599.60	111740.50	111738.90

Notes: We selected the combination of independent variables which minimized Akaike's Information Criterion. Sampling weights are used. Robust standard errors are in parentheses. * p<0.1; ** p<0.05; *** p<0.01.

Measurement of willingness to pay: Respondents stated their willingness to pay for NHK programs in the same bidding-game format for each survey wave based on the three-stage double bound method. Respondents were asked how much they were willing to pay monthly to view television programs provided by NHK's terrestrial and satellite broadcasting services and NHK radio programs, assuming that the current reception fee system was terminated. The first question concerned willingness to pay for viewing NHK's terrestrial broadcasting programs and radio programs, and the second question focused on its satellite broadcasting programs. Note that the wording of the first question changed slightly following the survey in July 2014 when it was amended to elicit willingness to pay for NHK programs including programs provided through internet services along with terrestrial broadcasting and radio services. Starting from JPY1,500 as the base amount for the first question and JPY2,500 for the second, respondents chose between binary options regarding whether or not they were willing to pay the specified amounts. Nine price range categories were associated with each question. For the first question, the categories are [1] JPY0, [2] JPY1-249, [3] JPY250-499, [4] JPY500-999, [5] JPY1,000-1,499, [6] JPY1,500-1,999, [7] JPY2,000-2,499, [8] JPY2,500-2,999, [9] JPY3,000 and more. For the second question, the categories are [1] JPY0, [2] JPY1-249, [3] JPY250-499, [4] JPY500-749, [5] JPY750-999, [6] JPY1,000-1,249, [7] JPY1,250-1,499, [8] JPY1,500-1,999, [9] JPY2,000 and more. Those who chose the lowest categories (except no payment =JPY0), or the highest categories ("more than JPY3,000" for the first question and "more than JPY2,000" for the second) stated the specific amount they were willing to pay.