Discussion Paper No. 049

The Broadband Market in Japan

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December, 2004

21COE
Interfaces for Advanced Economic Analysis
Kyoto University

R. Taplin & M. Wakui eds.
Japanese Telecommunications Market and Policy in Transition
Routledge, forthcoming

Chapter 2

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Acknowledgements
Thanks are due to the following people. Dr. Ruth Taplin and Professor Satoko Wakui, the editors of this book, gave me careful advice. Hideyuki Ohashi, Kazuhiro Mita, Syohei Shoji, and Toshio Kawamoto of the Ministry of Internal Affairs and Communications worked out *The Effective Competition Review of Japan's Telecommunications* (2004.6) to which this paper is much indebted. Toshihumi Kuroda, Masayuki Sato, and Masahito Anbashi of the Graduate School of Economics, Kyoto University, assisted our joint research with great energy. Furthermore, part of this work first appeared in *Yasashii Keizaigaku (Easy Economics): Information-Telecommunication and Competition Policy* (2004.7) in the Nihon Keizai Shimbun, the Japanese economic newspaper.

1. Introduction

Recall that only a few years ago we were convinced that Japan's telecommunication industry lagged behind Europe and the United States by some ten years. However, the recent development of broadband services in Japan has been remarkable. According to the Ministry of Internal Affairs and Communications (MIC), as of August 2004 the penetration rate of broadband services had reached 34% of Japanese households, brokendown as follows: (1) asymmetric digital subscriber lines (ADSL) 74.2%, (2) cable television (CATV) Internet 16.4%, and (3) fiber to the home (FTTH) 9.5%. Yahoo! BB, owned by Softbank Co, Ltd., currently maintains the top spot in the ADSL market, while K-Opticom of the Kansai Electric Power group is competing fiercely with NTT West for the FTTH market. At the same time, the low-speed ADSL market has been absorbed by the medium-speed ADSL market, whose users are now converting to high-speed ADSL and FTTH markets.

Given such competitive circumstances in Japan's broadband markets, in June 2004 the Japanese Ministry of Internal Affairs and Communications published *The Effective Competition Review of Japan's Telecommunications*, which examined Internet access services for fiscal year 2003. We collaborated with MIC to delineate the relevant markets and analyzed the substitutability of various forms of Internet access services. The purpose of this chapter is first, to summarize *The Review* and, second, to introduce our empirical research. Below we will avoid mathematical details and rely on the intuitive ability of readers to understand graphs. For the moment, we exhibit two important conclusions of this chapter.

First, using a nested logit model based on Ida and Kuroda (2004), we analyzed the access demand to such narrowband Internet services as dialup (DU) and integrated services digital network (ISDN) as well as such broadband Internet services as ADSL, CATV Internet, and FTTH. After measuring the own-price elasticities of access demand, represented by modulus, only the ADSL figure is inelastic (0.29), while the CATV and FTTH figures are on the borderline between elastic and inelastic (0.88~1.11). Thus, we conclude that the ADSL market is independent of other services. Furthermore, since the present Japanese broadband market is overwhelmingly dominated by ADSL, we divide it into three submarkets: low-speed, medium-speed, and high-speed. After measuring the own-price elasticities, the medium-speed ADSL figure

is very inelastic (0.15) but, interestingly, the low- and high-speed ADSL figures are highly elastic (7.32 and 6.74). The periphery of the large ADSL market is actually competing on both sides with narrowband services (DU and ISDN) and broadband services (CATV and FTTH).

Second, we demonstrate the results of conjoint analysis for both the users who can and cannot avail FTTH services, based on Ida and Sato (2004). Consequently, we recognize that stated preference (SP) depends on the actual availability of FTTH; willingness to pay (WTP) for 1 Mbps is about ¥30 ($0.27, given ¥1=$110) for people with access to FTTH while it is about ¥70 ($0.63) for people without access. Next, we compare SP and revealed preference (RP) in identical populations with access to FTTH. As a result, we see that their SP and RP are different; the WTP for 1 Mbps is about ¥30 ($0.27) based on SP, while it is about ¥20 ($0.18) based on RP.

This chapter is composed of five sections. Section 2 provides preliminary discussions that consider the success of Japan's broadband services. Section 3 summarizes *The Effective Competition Review of Japan's Telecommunications* published by MIC in June 2004. Section 4 introduces research by Ida and Kuroda (2004) that analyzes the demand substitutability of broadband services, while Section 5 introduces research by Ida and Sato (2004) that applies conjoint analysis to consumer preferences for broadband services. Finally, Section 6 discusses problems to be solved by Japan's broadband market in the future.

2. Why Success in Japan?

The current development of Japan's broadband Internet access services is remarkable. Figure 1 shows how the number of Internet users has transited. The number of narrowband Internet users has decreased, but broadband Internet users have increased. In August 2004 the latter overtook the former. At present, the penetration rate of Japan's broadband services is around 34%.

<Fig.1 Transition of Internet access services users >

Next, we turn to a breakdown of broadband services. Figure 2 illustrates how

the number of broadband Internet users has changed. First, we see that ADSL has played a leading role in the development of Japan's broadband services. ADSL users reached ten million in 2003, ranking Japan with Korea as a major ADSL-using nation. Second, the number of FTTH users continues to steadily grow, having exceeded a million in 2004. At the moment Japan has no peer in FTTH diffusion. Third, even though the CATV Internet user market is more than two million, its growth rate is small. In this respect the Japanese broadband market is different from that of USA where CATV Internet is the most popular.

<Fig. 2 Transition of number of broadband Internet users>

Today Japan's broadband service is reputedly the cheapest and the fastest in the world. An International Telecommunication Union (ITU) Internet Report entitled the *Birth of Broadband* compared rates per 100 kbps among various countries as of September 2003. Figure 3 shows that Japan ($0.09) is much cheaper than the USA ($3.53), UK ($6.37), and others.

<Fig. 3 International comparison of broadband rates per 100 kbps>

It has been said, however, that Japanese telecommunications lags ten years behind Europe and United States. Why are their positions now reversed? At this point, two hypotheses explain this fact.

First Japan's telecommunications policies have produced two results, one that met expectations and another that was unexpected. The latter success is based on the fact that the NTT group was not broken up. In 1990 and 1996, the Ministry of Posts and Telecommunications (the present Ministry of Internal Affairs and Communications) submitted reports that requested the divestiture of the NTT group; but after the Japanese government experienced difficulty dissolving, the company was finally reorganized under a holding company system. NTT has long supported a broadband Integrated Service Digital Network (B-ISDN) project in which NTT would establish fiber-optic access networks for all residences by 2015. Therefore, when the divestiture decision was overturned, the NTT group continued to invest into the construction of a broadband

network. On the other hand, the expected success is based on a through open access policy of NTT's regional telecommunications network by MCI. In 1994, a cost-based interconnection charge system was introduced; in 1996 interconnection charges consisted of a call setup fee plus a per second charge, with the opening of local networks; in 2000 a long-run incremental cost rule was adopted. Accordingly, in this industry Japanese transparent and radical open network policies have greatly promoted effective competition.

Second, many distinctive entrants have conveniently emerged while NTT was carrying out corporate streamlining--reluctantly at first but genuinely afterwards. Since scale economies and network externalities apply to the information and telecommunication industries, we cannot expect perfect competition. Therefore new entrants that have both the capability and willpower to compete with the incumbents are necessary to maintain effective competition in the market. Fortunately, in the Japanese telecommunications industry, many innovative entrants have emerged: DDI of the Kyocera group entered the long-distance telephone market, Yahoo BB! of the Softbank group entered the ADSL market, K-Opticom of the Kansai Electric Power Company joined the FTTH market, and so on. On the other hand, NTT confronted its competitors and reorganized under a holding company system in 1999 and drastically restructured its business in 2002. Consequently, stable and efficient competition has been realized in the Japanese broadband market.

3. Review of Japan's Broadband Market

As shown in the previous section, in Japan's broadband services, the ADSL market led the way, followed by the FTTH market. Competition over price and for market shares is very fierce. In June 2004, the Ministry of Internal Affairs and Communication published *The Effective Competition Review of Japan's Telecommunications,* which placed a special emphasis on the broadband Internet access market. Our purpose here is to introduce *The Review* and to explain the present situations of the ADSL, FTTH, and CATV-Internet markets.

3.1 Review of ADSL Market

ADSL users account for more than 70% of Japan's total broadband market. To begin with, we consider the scale of the ADSL market. Figure 4 shows the transition of the number of ADSL users. The figure has steadily increased, reaching a household penetration rate of 20.9% by the end of 2003. By prefecture, Tokyo has the highest penetration rate (30.3%), while Kagoshima has the lowest (8.2%). Regional disparities in the diffusion of ADSL remain fairly large.

<Fig. 4 Transition of number of ADSL users>

Figure 5 shows the transition of the increasing rates of ADSL users. After the explosion of ADSL services, the rate of increase gradually decreased. From the end of 2002 to the end of 2003, the figure decreased from 30% to 10% because of rapid changeovers from ADSL to FTTH.

<Fig.5 Transition of increasing rates of ADSL users>

Second, we consider market shares. Figure 6 shows the transition of ADSL market shares. NTT East and West, the top two ADSL providers, have a 37% market share in eastern and western Japan, respectively. Note, however, that NTT East’s market share has constantly remained in the upper 30% while NTT West’s has suddenly decreased from the 40% level. The competition that started in the Tokyo area has finally reached western Japan.

<Fig.6 Transition of ADSL market shares>

Third, we consider ADSL market concentration. Figure 7 shows the Herfindahl-Hirshman Index (HHI). The figure exceeds 2500, implying strong oligopolistic tendencies. Scrutinizing the details, concentration had decreased up to September 2002, reflecting the decline in the market shares of NTT East and West, but an upward trend began that reflected the increase in Softbank’s market shares. Figure 8 illustrates the transition of the ADSL market shares for the top three companies. The figure is larger than 80% and still rising.

<Fig.7 Transition of ADSL market concentration (HHI indexes) >

<Fig. 8 Transition of ADSL market shares of the top 3>

Fourth, we address the level of ADSL rates as shown in Figure 9. Such incumbent ADSL providers as NTT East, West, and eAccess reduced their rates largely in response to the Softbank's surprising entry in 2001. Figure 10 compares international ADSL rates. Alongside Korea, Japan has the cheapest rates per 1kbps.

< Fig. 9 Transition of levels of ADSL rates>

< Fig. 10 International comparison of ADSL rates>

3.2 Review of FTTH Market

FTTH users comprise about 10% of Japan's broadband market. First, we look at the scale of the FTTH market. Figure 11 shows the transition of the number of FTTH users. The figure is rapidly increasing. Figure 12 illustrates the transition of the increasing rates of FTTH users. The national average is larger than 40%; furthermore, NTT East and West are growing faster than the national average.

< Fig. 11 Transition of number of FTTH users>

< Fig. 12 Transition of increasing rates of FTTH users >

Second, we turn to the FTTH market shares. Figure 13 shows the transition of the FTTH market shares. Note that NTT East and West account for about 60% of the total market. The growth of NTT West is especially remarkable. Among power affiliated companies, K-Opticom of the Kansai Electric Power group enjoys a large market share. Since NTT West and K-Opticom are competing fiercely, Japan's broadband market demonstrates a *West-High/East-Low* tendency: high penetration in western Japan and low penetration in eastern Japan.

< Fig. 13 Transition of FTTH market shares>

Third, we consider FTTH market concentrations. Figure 14 shows the transition of HHI Indexes in the FTTH market. The figure has risen sharply to 3000, creating an extremely oligopolistic market that reflects the increase in the market shares of NTT East and West. Figure 15 illustrates the transition of the FTTH market shares of the top three companies. The figure has reached 80%. However, it is necessary to divide the FTTH market into two submarkets: home and apartment. As shown in Figure 16, NTT East and West dominate rivals in the home market. On the other hand, as shown in Figure 17, NTT East, West, and USEN are almost equally matched in the apartment market.

< Fig. 14 Transition of FTTH market concentration (HHI Indexes)>

< Fig. 15 Transition of FTTH market shares of top 3 companies>

< Fig. 16 Home FTTH market shares>

< Fig. 17 Apartment FTTH market shares>

Fourth, we refer to the level of FTTH rates. Figure 18 shows the transition of FTTH rates. Since the beginning of the service, each company has lost levels. Even though the FTTH market is highly oligopolistic, the difference between ADSL and FTTH rates are so small that price competition across markets seems to be working. In the future, since we expect a rapid changeover from ADSL to FTTH, Japan will set an interesting precedent in which the migration of broadband services becomes problematic around the world.

< Fig. 18 Transition of FTTH rates>

3.3 Review of CATV Internet Market

CATV Internet users comprise about 20% of Japan's broadband market. We first look at the scale of the CATV Internet market. Figure 19 shows the transition of the number of CATV Internet users, which is steadily increasing. Figure 20 illustrates the transition of the number of CATV Internet providers. Since the number is larger than 300, the market looks competitive. Figure 21 compares international CATV Internet fares. We conclude that Japan has the cheapest CATV Internet rates. However, note that CATV Internet

plays not a leading but an important supporting role in Japan's broadband market.

< Fig.19 Transition of number of CATV Internet users >

< Fig. 20 Transition of number of CATV Internet providers >

< Fig. 21 International comparison of CATV Internet fares >

4. Demand Substitutability of Broadband Services

This section investigates demand substitutability based on Ida and Kuroda (2004). First we explain the data and the descriptive statistics and then discuss the estimation results of broadband demand with a discrete choice model called a nested logit model. Considering the own-price elasticities of access demand, we found that ADSL is very elastic while FTTH and CATV are borderline cases.

4.1 Data and descriptive statistics

In the following we explain the descriptive statistics and the data collected by a series of surveys of Internet access demand for private use conducted according to *The Guidelines for the Competition Review of Japan's Telecommunications* and *The Implementation Manual for FY 2003*, published in November 2003 by the Ministry of Internal Affairs and Telecommunications.

The survey was carried out as a Web questionnaire, and a representative sample was randomly chosen from households with access to all five Internet alternatives: (i) dialup (DU), (ii) always-on ISDN, (iii) ADSL, (iv) FTTH, and (v) CATV Internet. The total number of observations was 1013; excluding omissions and abnormalities, we obtained 799 observations for nominal speed data. Questions included: (i) average expenditures per month (price), (ii) nominal access speed, (iii) type of Internet access and service provider, (iv) and such individual characteristics as gender, age, income, type of residence, living area, occupation, and so on.

The basic descriptive statistics are shown in Figure 22. Selection ratios follow: DU (2%), ISDN (5%), ADSL (67%), FTTH (8%), and CATV (18%). Since the number of DU and ISDN users was very limited, it was difficult to consider them

independent alternatives; therefore, we combined DU and ISDN into one narrowband alternative. Average monthly expenditures, defined as the sum of connection fees and ISP charges (and communication charges for dialup Internet users), are shown as follows: DU: ¥3946 ($35.9), ISDN: ¥5207 ($47.3), ADSL: ¥4344 ($39.5), FTTH: ¥5929 ($54.1), and CATV: ¥5200 ($47.3). Narrowband services are not always cheaper than broadband services because their charges are usage sensitive while broadband are flat. Among broadband services, FTTH is the most expensive while ADSL is the cheapest, as obviously expected. Average nominal access speeds are shown as follows: DU: 52 kbps, ISDN: 65 kbps, ADSL: 10 Mbps, FTTH: 82 Mbps, and CATV: 11 Mbps. A huge gap exists between narrowband and broadband services as well as differences among broadband services (ADSL, CATV, and FTTH) concerning nominal access speed.

<Fig. 22 Basic statistics of broadband markets>

In what follows we scrutinize the details of the survey. The reasons for choosing their present Internet access service are shown in Figure 23: (1) always-on connectivity (55.9%); (2) a flat rate system (41.0%); (3) low prices (31.7%); (4) transmission speed (25.7%); and such miscellaneous reasons as easy introduction, no-charge campaigns, IP telephony, and CATV service.

<Fig. 23 Reasons for choosing Internet access service>

Figure 24 gives the reasons for using the Internet: (1) Web browsing (44.7%); (2) e-mail (30.7%); (3) online shopping (5.5%); (4) online chat and bulletin boards (4.2%). Multiple answers were permitted for the above questions.

<Fig. 24 Purposes for seeking Internet access>

We also examined the differences between NTT and non-NTT users. On average, NTT users pay about ¥1000 ~ ¥1500 more per month than non-NTT users: NTT dominates the market despite higher Internet access fees. NTT users still account for 32% of the ADSL and 65% of the FTTH markets. The results of a poll of choice

criteria of current Internet access providers (allowing for multiple answers) are summarized in Figure 25: (1) low price (44.4%), (2) brand power (23.0%), (3) access speed and functionality (22.7%), (4) stability and reliability (17.9%). Internet service users can be divided into two groups: non-NTT users who mainly focus on price aspects, and NTT users who emphasize brand power or reliability.

<Fig. 25 Reasons for choosing Internet access provider>

4.2 Nested logit model analysis of broadband services

Next we examine the estimation results of a discrete choice model analysis of broadband service demand. At first, it will be helpful to refer to Taylor's informative survey (2002). One innovation of demand analysis literature in the 1980s and 1990s is the widespread use of discrete choice models, particularly for analyzing access demand based on the assumption that consumer choice is qualitative with or without access. Perl (1978, 1983) was one of the first to apply discrete choice models to the analysis of telecommunications access demand, followed by such discrete choice models as logit and probit (for example, Ben-Akiva et al. 1989; Kridel, 1988; Taylor and Kridel 1990; Kridel and Taylor 1993; Bodnar et al. 1988; Solvason 1997).

The emergence of a *nested logit model*, which partially alleviated the irrelevance of the independent alternative (IIA) properties of conditional logit models, was especially important (see Train et al. 1987, 1989). Although analyses of broadband demands are limited, Madden et al. (1999), Madden and Simpson (1997), Eisner and Waldon (2001), Kridel et al. (2001), and Dufy-Deno (2003) are noteworthy pioneers in the field. Ida and Kuroda (2004), however, offered the first comprehensive analysis of broadband service demand including FTTH, the actual broadband service.

We next analyzed Internet access demand using a nested logit model based on Ida and Kuroda (2004). Dependent variables are the four Internet access services: (i) NB (DU/ISDN), (ii) ADSL, (iii) CATV Internet, and (iv) FTTH. Independent variables are: (i) the fixed term of each alternative, (ii) average monthly expenditure (price), (iii) nominal access speed, and (iv) an NTT users dummy variable.

If we adopt a nested logit model, determining the nested choice structure becomes problematic (see Greene, 2003). Thus we compared the degrees of fitness of

the models (that is, the adjusted McFadden R^2) and determined the best model with the highest value. Consequently, we deemed it appropriate to divide the four alternatives into two categories: a narrowband category that includes DU and ISDN, and a broadband category that includes ADSL, CATV, and FTTH.

Estimation results are shown in Table 1. Since a McFadden R^2 value of 0.3 generally corresponds to around 0.6 of OLS R^2, we concluded that a McFadden R^2 value 0.49 represents a high degree of fitness. Fixed terms and price parameters are statistically significant, but not nominal speed parameters. Furthermore, although we included an NTT dummy variable in the model because NTT users pay significantly more than non-NTT users, this statistical significance is very low.

< Table 1 Estimation results of a nested logit model of broadband services>

Let us next consider the own-price elasticities of access demand, as summarized in Figure 26. The ADSL figure is about 0.3, and thus its service is very inelastic. An increase in ADSL price does not significantly decrease the demand for ADSL. Its market itself is so gigantic that ADSL users are switching from low-speed (1.5 Mbps) to medium-speed (8 ~12 Mbps) and finally to high-speed band (more than 24 Mbps) within the ADSL market. Below we scrutinized the ADSL market and divided it into three submarkets. On the other hand, own-price elasticities of access demand are about 1.1 for FTTH and 0.9 for CATV, which are borderline cases. This means that a 1% increase in price induces almost the same decrease in demand. Consequently, ADSL service is less elastic to price than FTTH and CATV, even though the latter two are not highly elastic.

< Fig. 26 Own elasticities of broadband-access demand>

4.3 Nested logit model analysis of ADSL services

In the previous section, we showed that the own-price elasticity of ADSL demand is much lower than FTTH and CATV. However, since the ADSL market itself is so huge, occupying around 70% of the entire broadband market, it is informative to examine the submarkets of ADSL.

At this point, we divide the ADSL market into three submarkets: low-speed (around 1.5 Mbps), medium-speed (around 8~12 Mbps), and high-speed (more than 24 Mbps). Note that medium-speed ADSL users account for 74% of the ADSL market. However, medium-speed ADSL users are expected to switch to high-speed ADSL and eventually to FTTH. In fact, respondents to a questionnaire concerning Internet access services said that in the near future they want to use the following (multiple answers admitted): (1) FTTH (74.7%), (2) ADSL (35.2%), (3) CATV (29.8%), and (4) fixed wireless access (FWA) (12.6%).

Looking at the own-price elasticities of access demand, shown in Figure 27, the medium-speed ADSL figure is about 0.15, which is very inelastic. On the other hand, the figures are 7.3 for low-speed ADSL and 6.7 for high-speed ADSL, which is quite elastic. In conclusion, ADSL users can be divided into two groups: those who are insensitive to price changes, the medium-speed ADSL users, and those who are very sensitive to price changes, the low- and high-speed ADSL users.

< Fig. 27 Own elasticities of ADSL access demand>

5. Conjoint Analysis of Broadband Markets

This section investigates the stated preference of broadband markets based on Ida and Sato (2004). We first explain the conjoint analysis used in the analysis. We next discuss the estimation results. Consequently, we found that the actual availability of FTTH has an effect on the stated preferences of consumers and also that stated preference and revealed preference may vary for certain populations.

5.1 Conjoint analysis

The key approach adopted here is *conjoint analysis*, or the stated preference method (SPM). It aims to measure consumers' preferences based not on the actual data observed in the market but instead on answers to a virtual questionnaire, which highlights a remarkable difference from revealed preference methods (RPM). Compared with RPM, one advantage of SPM is that it is virtual by nature and scrutinizes consumers'

preferences that are generally ignored or overlooked. For instance, even when we cannot collect actual product data prior to its market launch, we can quantitatively evaluate such products with SPM.

Because of such merits, SPM has been utilized in market research fields for product development and demand forecasting. Additionally, it is applied to such non-market goods as environment and health, the market prices of which are difficult to establish through market mechanisms. Although little research has been done in the field of telecommunications, a noteworthy exception is Madden and Simpson (1997) who studied residential broadband subscription demand using SPM. Following them in a methodological sense, Ida and Sato (2004) is the first comprehensive application of SPM to FTTH, the actual broadband service.

Conjoint analysis assumes that goods or services are composed of attributes that can be profiled. For example, in a broadband service context, speed, price, the availability of IP phones, the distribution of TV programs, and the symmetry between uploading and downloading functions are considered attributes. Particular analysis purposes shape the contours and number of attributes introduced into a profile. If we include too many attributes, respondents will have difficulty answering the questions. On the other hand, if we incorporate too few attributes, the description of data will become inadequate. Accordingly, we need to repeatedly conduct pretests and carefully observe consumer recognition patterns before determining adequate profiles. The profiles used in Ida and Sato (2004) were made from the combination of attributes and levels enumerated in Table 2.

< Table 2　Profiles of conjoint analysis>

5.2 Data and descriptive statistics

Next we explain the data and the descriptive statistics collected by the same survey based on *The Guidelines* and *The Implementation Manual* as explained above. The survey was carried out as a Web questionnaire because using the Internet was inexpensive, quick, and because the object of this research itself was related to Internet access. Respondents were randomly chosen from people who have access to all five Internet alternatives: (i) dialup Internet (DU), (ii) always-on ISDN, (iii) ADSL, (iv)

FTTH, (v) CATV Internet. The total number of samples was 1013. Ida and Kuroda (2004) analyzed RP for broadband based on the data. The present study also utilizes the same survey for people who don't have access to FTTH.

We then surveyed a random sample of two groups to investigate how actual FTTH availability influences SP, or how the SP and RP of identical populations are different. Group A, derived from a population having access to all alternatives, is 105. Group N, derived from the population without access to FTTH, is 104.

Looking at the answers from all samples indicated in Figure 28, the stated choices of the respondents (with SPM) breakdown as follows: (1) ADSL (57%), (2) CATV Internet (13%), and (3) FTTH (30%). On the other hand, Ida and Kuroda (2004) report that the actual choices (with RPM) are: (1) ADSL (72%), (2) CATV Internet (19%), and (3) FTTH (9%). It is interesting that ADSL is overwhelmingly supported in SPM as well as in RPM, but the ratio of choosing FTTH in SPM is higher than in RPM.

< Fig. 28 Choice results of conjoint analysis>

Next, comparing the two sub-samples of groups A and N, the ratio of choosing ADSL is higher in group N (60.1%) than in group A (52.5%); on the other hand, choosing FTTH is lower in group N (27.6%) than in group A (32.5%). Accordingly, we assume that the actual availability of FTTH would influence consumers' preferences and cause different choice behavior in this conjoint analysis.

5.3 Influence of FTTH availability on stated preference

Conjoint analysis studies consumer preferences based on their virtual choices. It is interesting to consider whether respondents' choices are influenced by the actual availability of alternatives. As stated, the respondents were divided into two sub-samples: group A with access to FTTH and group N without, a division merely based on the difference of living environments of respondents; otherwise the questionnaire was identical for the two groups. If this difference in the actual availability of FTTH systematically influences the consumers' SP, the estimated coefficients will be different between the two groups.

Figure 29 summarizes the estimation results of groups A and N, that is, the

values of WTP. The WTP for 1 Mbps is about ¥30 ($0.27) for group A individuals who have access to FTTH, while it is about ¥70 ($0.63) for group N without. People without access to FTTH have a higher preference for an increase in access speed than those to whom FTTH is available.

<Fig. 29 FTTH availability and the speed WTP>

FTTH is mostly available in such urban areas as Tokyo, Osaka, and Nagoya; areas without access to FTTH are mainly rural or sparsely populated. In urban areas, the competition between firms who provide ADSL and FTTH is fierce; therefore, people living in urban areas can easily switch services or providers. On the other hand, there is little or no competition in rural areas, where a single, or at worst no firm, is providing broadband services. Therefore, since it is important for group A to locate better, cheaper broadband services, they are more aware of price and speed; group N is less concerned because they are primarily concerned with securing access to broadband services.

5.4 Comparison of stated and revealed preferences

We next investigate whether the SP and RP of identical respondents are different. This paper has so far analyzed the SP of broadband services. For a comparative analysis of SP and RP, we use the SPM results of group A derived from the present study and the RPM results of Ida and Kuroda (2004).

According to previous research, SP and RP don't always correspond with each other, even though based on random samples from the same population. Carson et al. (1996) introduced examples that suggest the ratio of a RP value to a SP value varies from 0.005 to 10.269.

As shown in Figure 30, SP and RP are clearly divergent. As for the WTP of 1 Mbps, the figure of SP is about ¥30 ($0.27), and RP is about ¥20 ($0.18). Why is the WTP of SP higher than RP? Azevedo et al. (2003) discussed a similar example in which the WTP of SP is two and a half times higher than the WTP of RP. They argue that respondents tend to consider income constraints "softer" in SP than in RP. Besides, as Louviere et al. (2000) state, since SPM primarily considers innovative or qualitative changes of goods or services, SP is thought to indicate not a temporary but a long-term

preference. In this light, it is not surprising that in rapidly developing broadband services the WTP of SP is one and a half times higher than RP.

< Fig. 30　Discrepancies between SP and RP>

6. Further Discussions: Future Problems

In the world, Japan's broadband market took off the quickest, to some extent by chance yet it was also inevitable. In this final section, instead of summing up the previous discussions, we consider four future problems faced by Japan's broadband industry.

The first is a problem confronting the Ministry of Internal Affairs and Communications. When it was called the Ministry of Posts and Telecommunications, MIC was regarded as second-rate; now twenty odd years after telecommunications liberalization it has become a leader in information/communications policies. There is, however, a matter of concern. Such industrial policies as universal service support and the convergence between communications and broadcasting are becoming increasingly important issues that will not be resolved only by competition policies. It seems difficult even for MCI, a first-rank ministry today, to bear the heavy responsibilities of both competition and industrial policies in the telecommunications industry.

The second is a problem facing NTT. Japan's broadband markets has succeeded because, on a national scale, NTT has ubiquitously provided telecommunications services, including broadband. Sooner or later, after large numbers of customers, mainly business users, replace plain, outdated telephone services with IP phones, the telephone revenues of NTT East and West will sharply decline, and their publicly switched telephone networks will not be maintained. Since fierce price competition has already started in the mobile phone market, NTT DoCoMo cannot afford to subsidize NTT East and West any longer. One possible outcome suggests that NTT East and West will not hold the telephone networks forever and replace telephone networks with well-planned, high-speed IP broadband networks.

The third is a problem of new entrants. Japan's success in broadband Internet diffusion owes a great deal to the new businesses of various entrants. However, their profitability is extremely low. If such “upstart entrants” are beaten and chased from the

market, the effects of market mechanisms will be very limited. In particular, we should closely follow the future fortunes of Softbank, which is different from NTT and even the other entrants because it does not have a strong business financial supporter. Even though opinions differ over Softbank's business strategy, the explosive development of Japan's broadband market would have been greatly delayed without its surprising entry.

Finally, the fourth point concerns the demand side. Even if information can interactively and physically flow at 100 Mbps on optical fibers to homes, possessing such capability is meaningless without rich, valuable contents to be exchanged. Unfortunately, current broadband services offer only cheap substitutes of existing services without creating new values for society. In the future all of us in the industry must use broadband technology to create higher social values through such service telemedicine and distance learning.

The regulatory reform of Japan's telecommunications used to import experiences from overseas. In broadband services, however, Japan has to find its own path. Imitation is easy, but innovation is difficult. From now on Japan's broadband market faces a crucial juncture.

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Fig.1　Transition of Internet access services users

(http://www.soumu.go.jp/w-news/2004/040930_2.html)

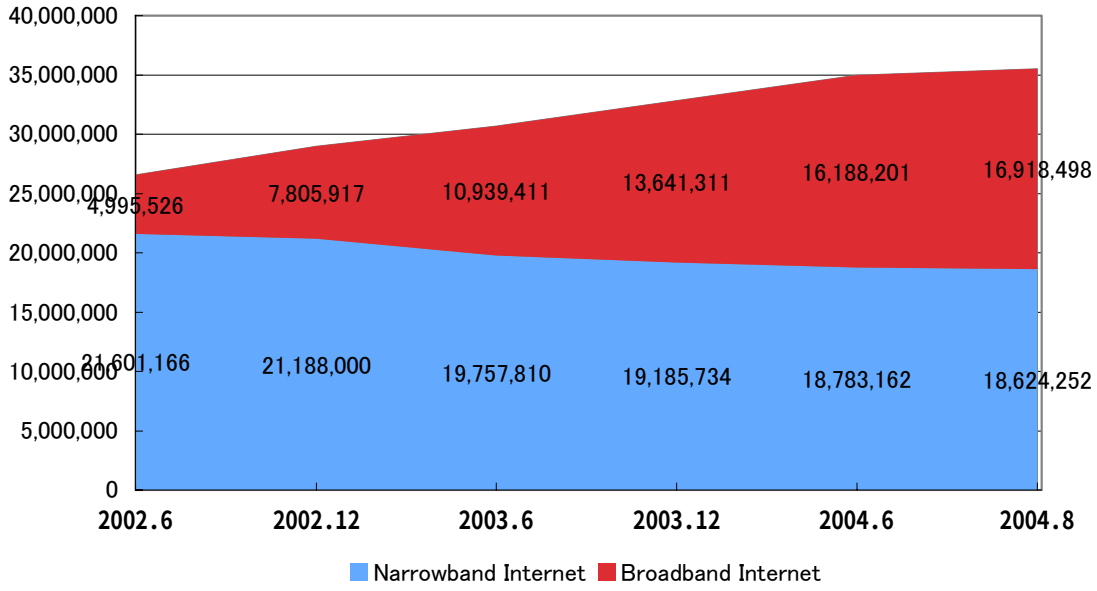

Fig. 2 Transition of number of broadband Internet users

(http://www.soumu.go.jp/w-news/2004/040930_2.html)

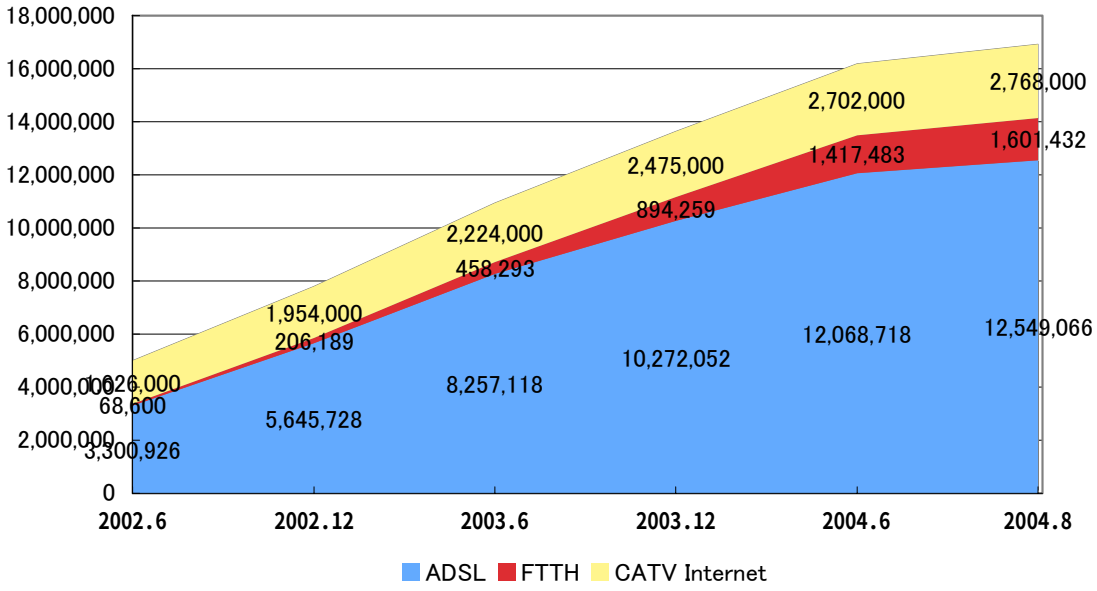

Fig. 3　International comparison of broadband rates per 100 kbps

(ITU Internet Report 2003: Birth of Broadband, 2003.9)

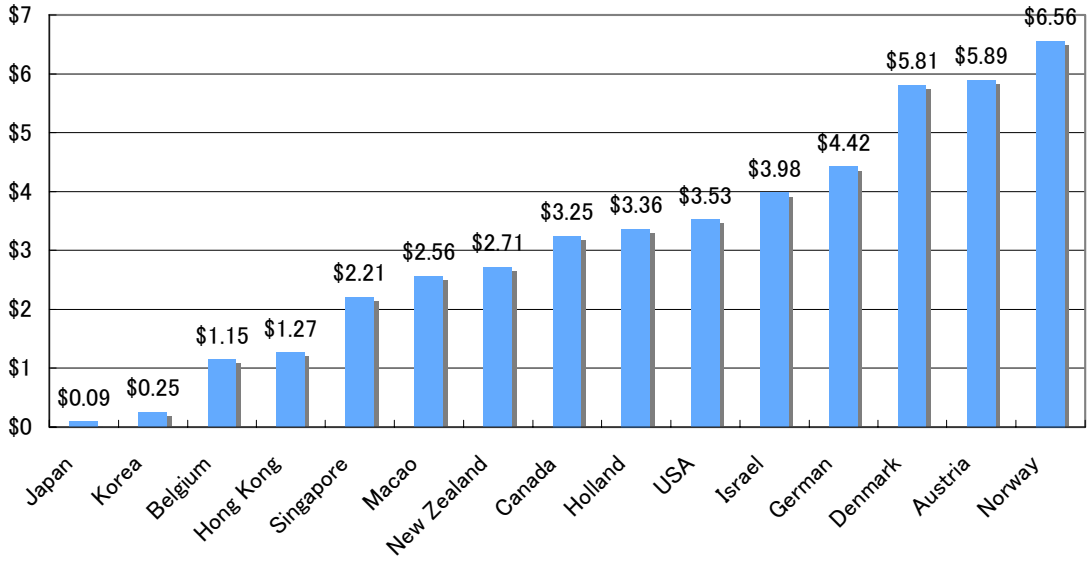

Fig. 4 Transition of number of ADSL users (MIC, 2004, Fig. A-1-3)

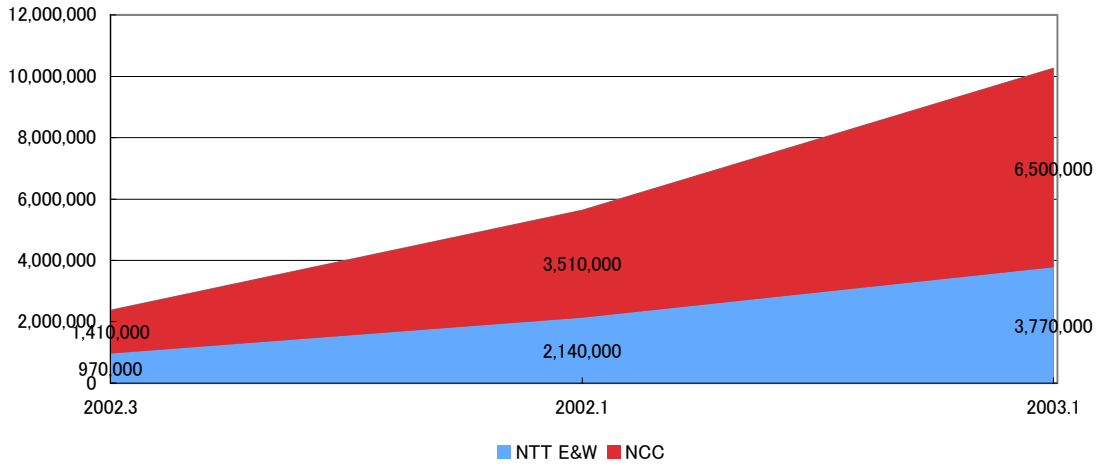

Fig.5 Transition of increasing rates of ADSL users (MIC, 2004, Fig.A-1-10,11)

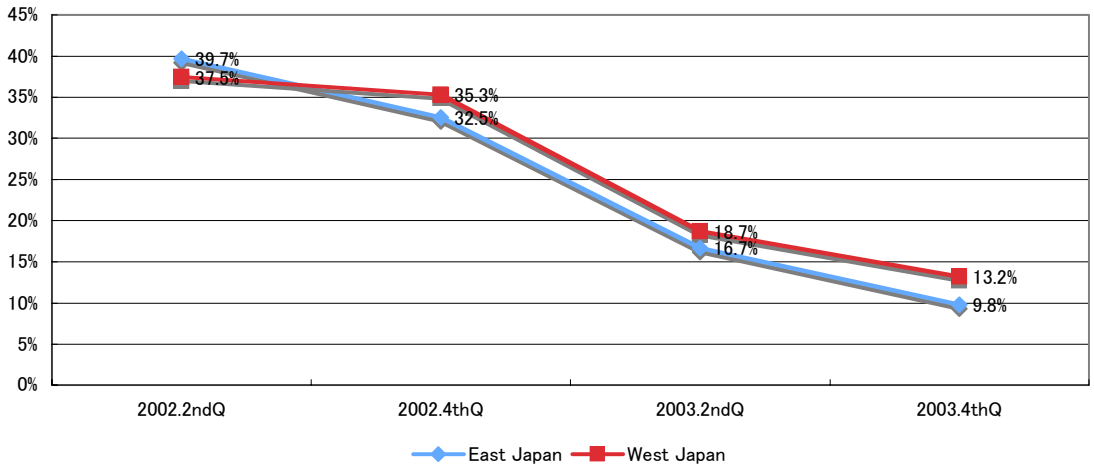

Fig.6　Transition of ADSL market shares (MIC, 2004, Fig.A-1-16,17)

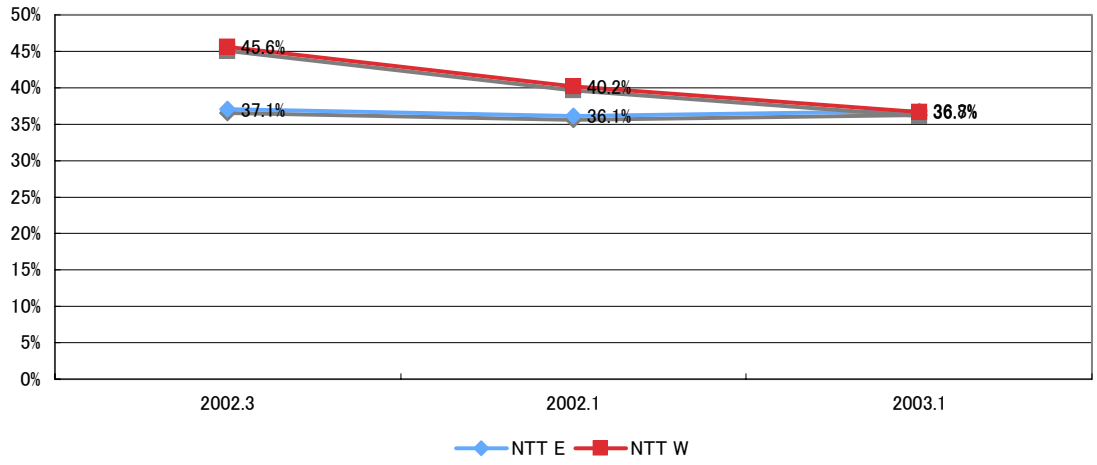

Fig.7 Transition of ADSL market concentration (HHI indexes) (MIC, 2004, Fig.A-1-23)

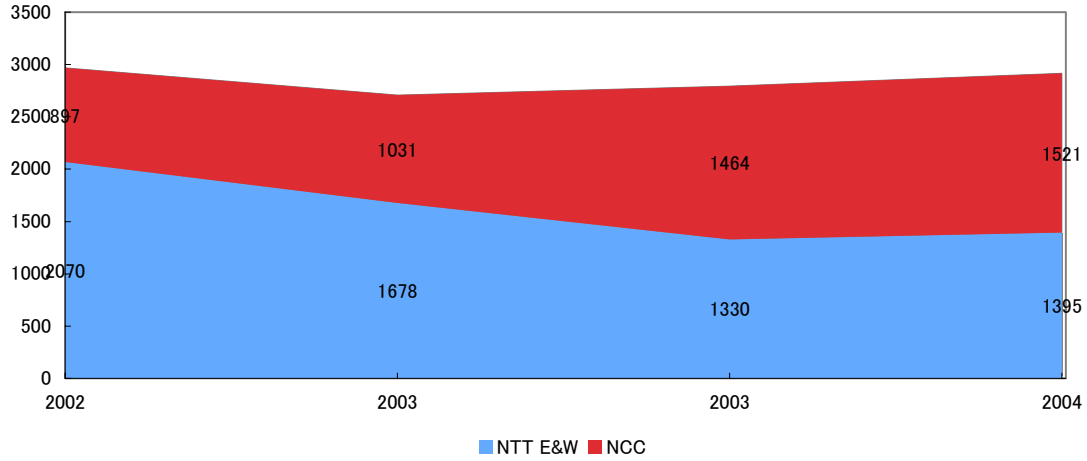

Fig. 8　Transition of ADSL market shares of the top 3 (MIC, 2004, Fig.A-1-24)

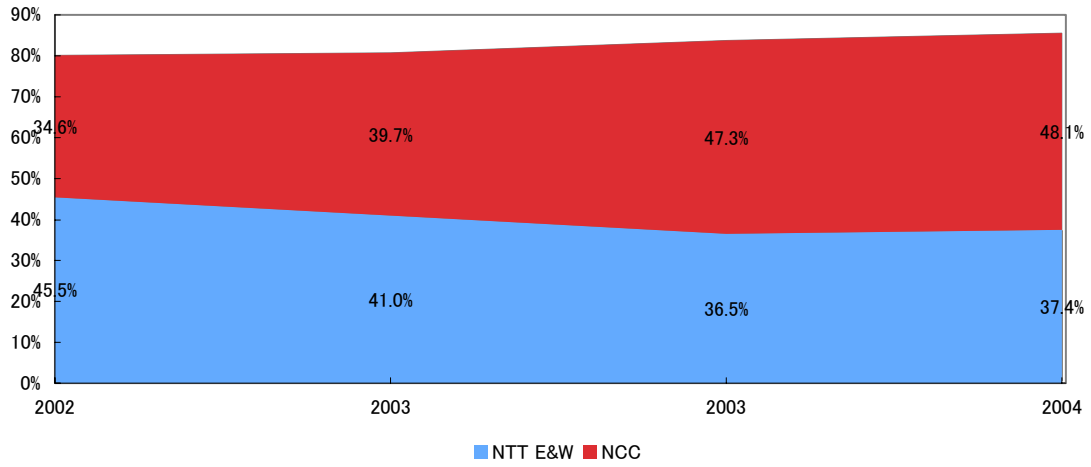

Fig. 9 Transition of levels of ADSL rates (MIC, 2004, Fig.A-1-29)

(Figures exclude modem rental charges, and ISP is Biglobe.)

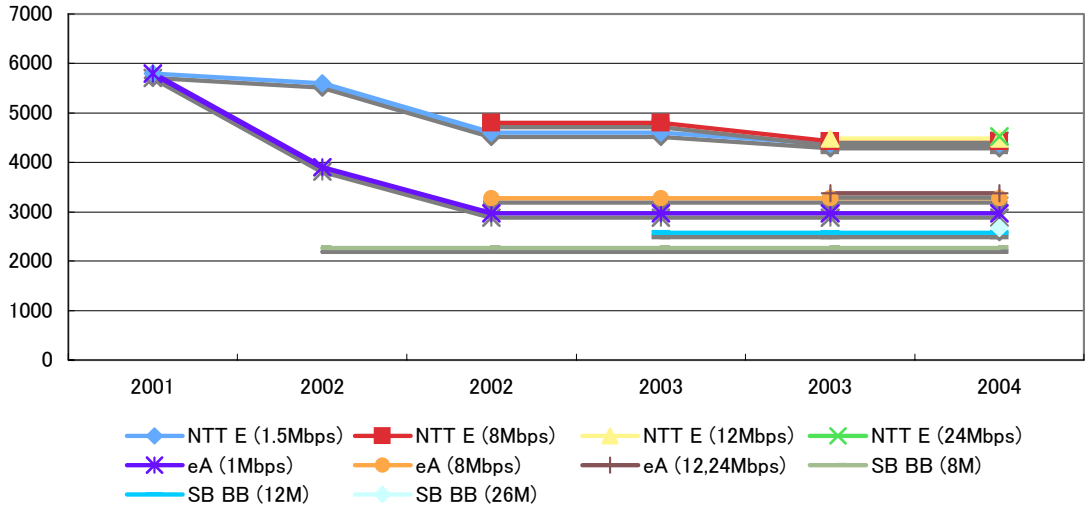

Fig. 10 International comparison of ADSL rates (MIC, 2004, Fig.A-1-30)

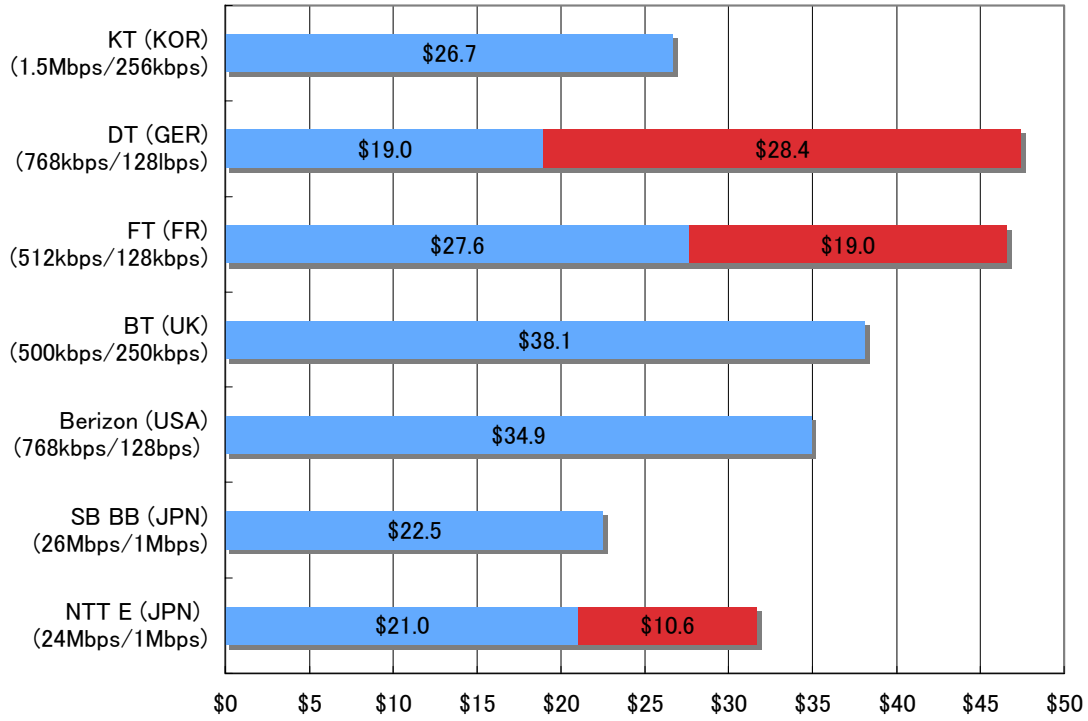

Fig. 11　Transition of number of FTTH users (MIC, 2004, Fig.F-1-1)

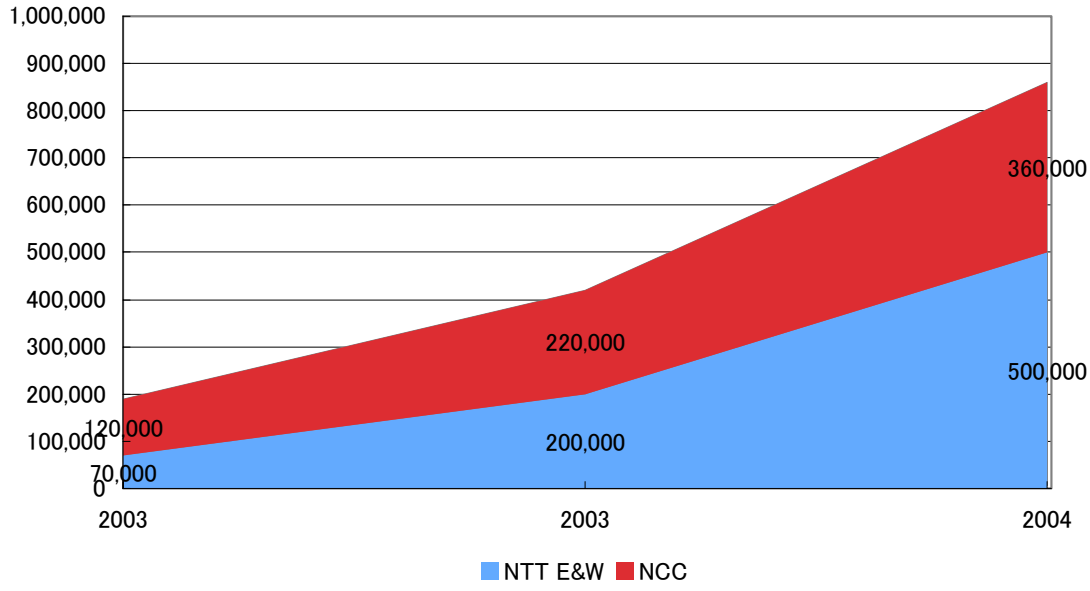

Fig. 12　Transition of increasing rates of FTTH users　(MIC, 2004, Fig.F-1-6)

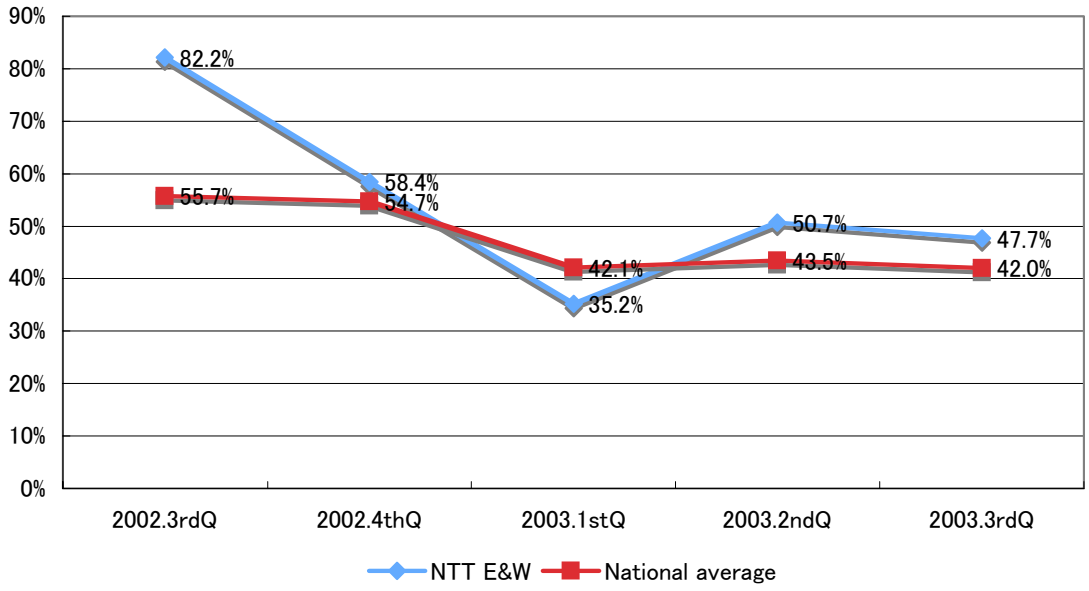

Fig. 13 Transition of FTTH market shares (MIC, 2004, Fig.F-1-6)

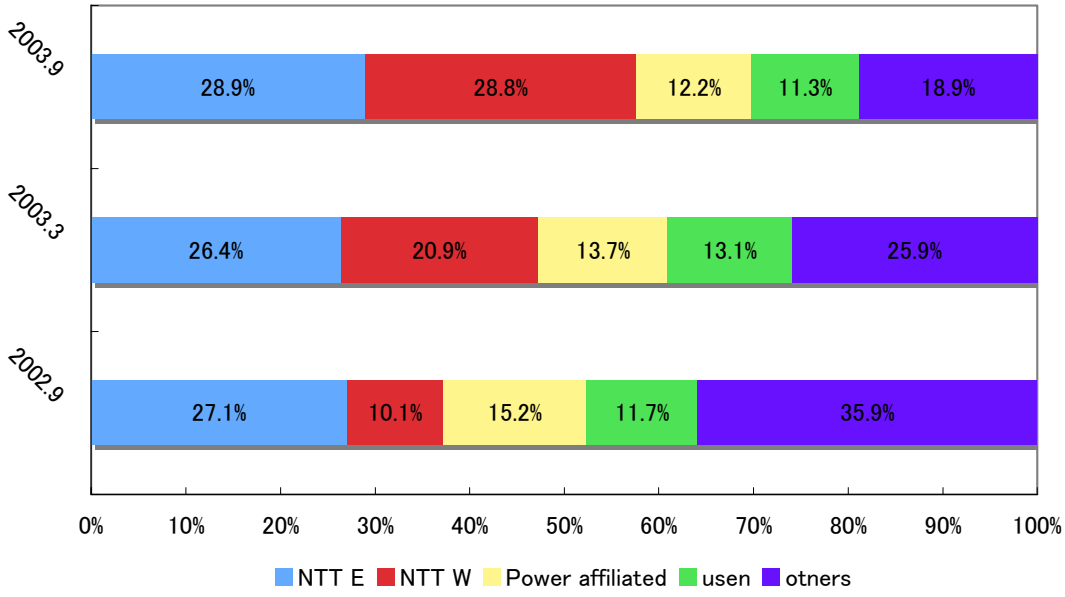

Fig. 14 Transition of FTTH market concentration (HHI Indexes) (MIC, 2004, Fig.F-1-8)

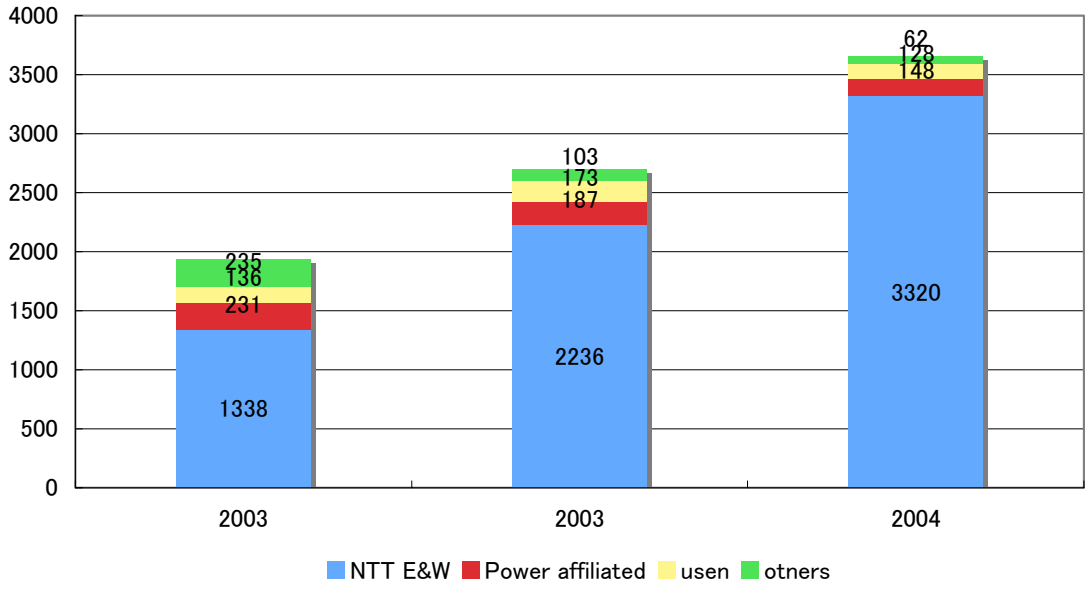

Fig. 15 Transition of FTTH market shares of top 3 companies (MIC, 2004, Fig.F-1-10)

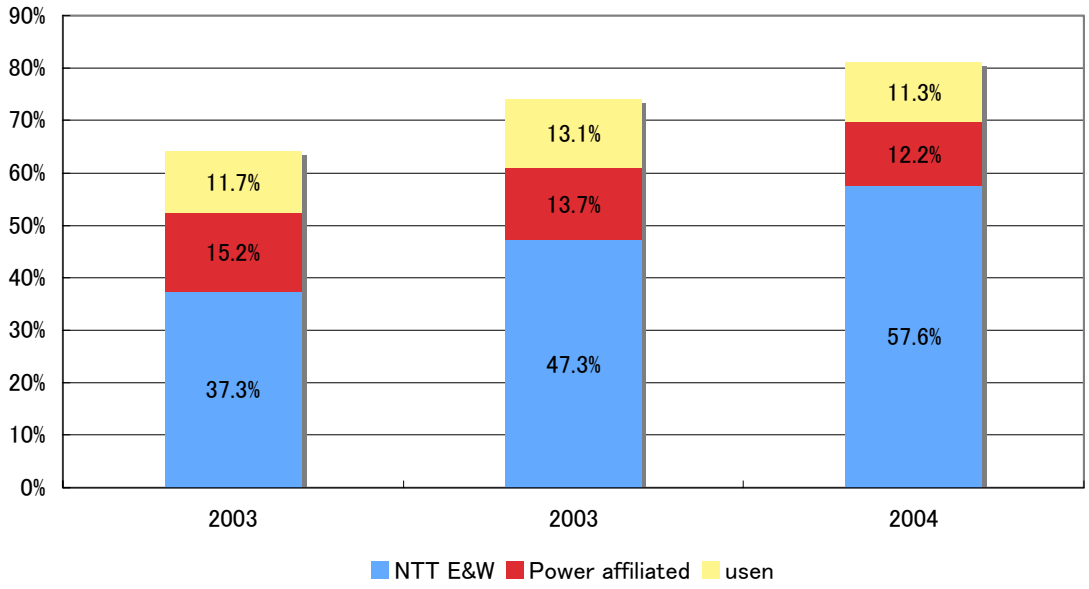

Fig. 16　Home FTTH market shares (MIC, 2004, Fig.F-2-8.9)

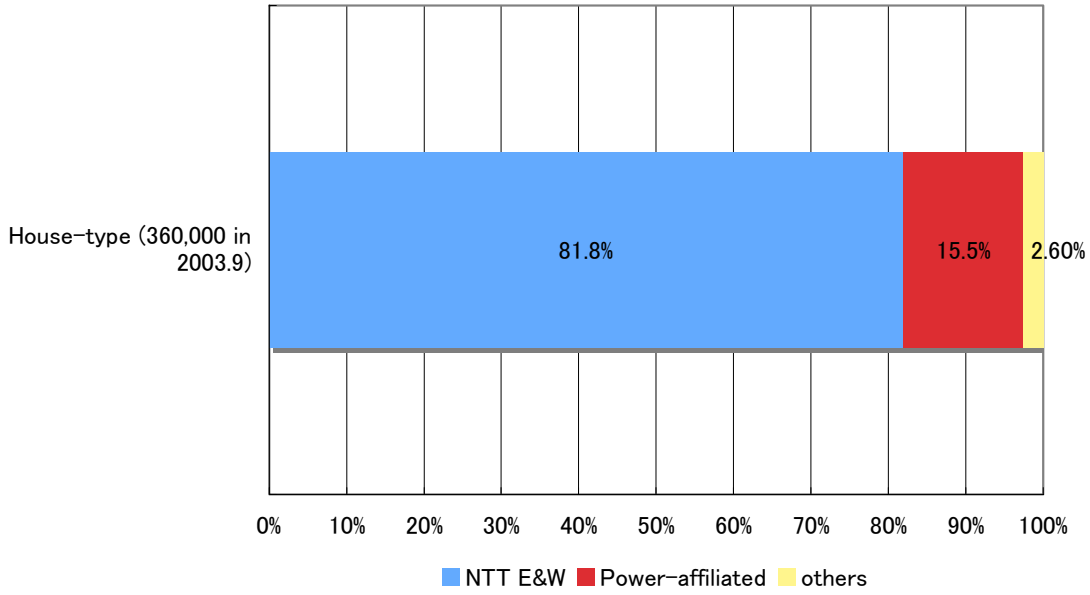

Fig. 17　Apartment FTTH market shares (MIC, 2004, Fig.F-2-8.9)

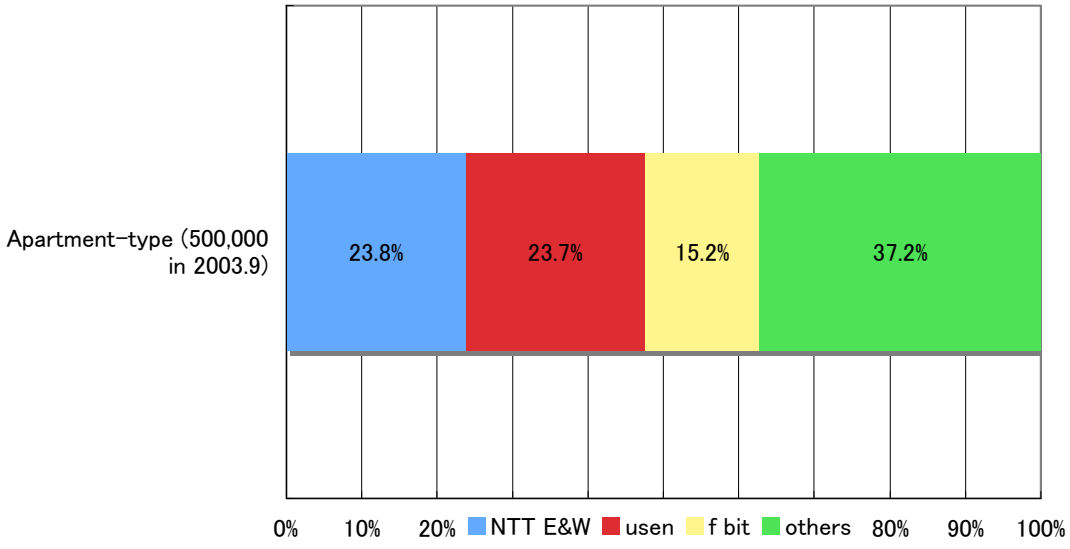

Fig. 18　Transition of FTTH rates　(MIC, 2004, Table F-1-1)

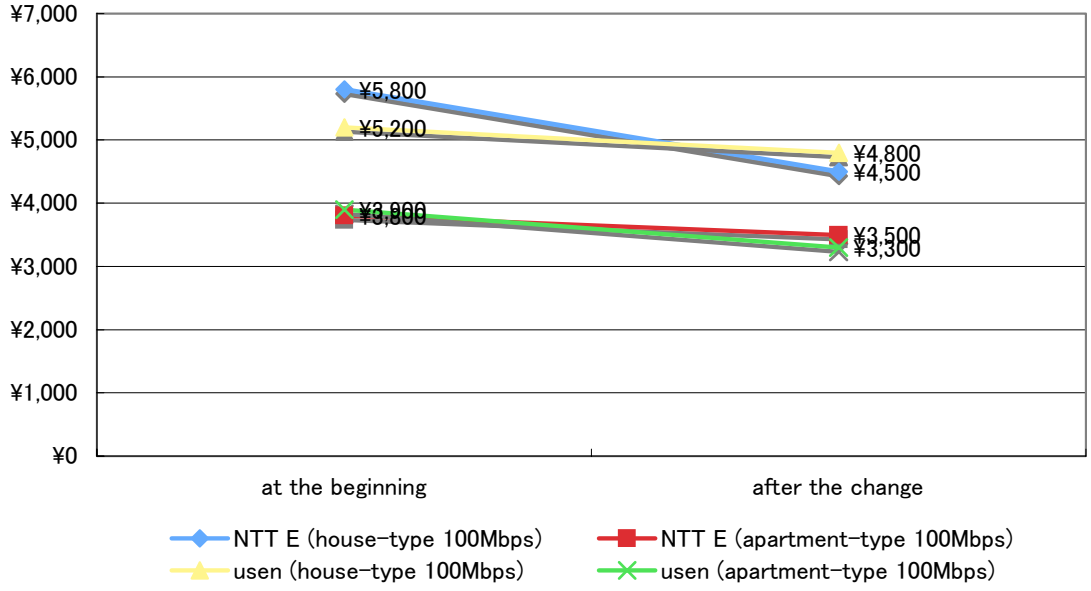

Fig.19 Transition of number of CATV Internet users (MIC, 2004, Fig.C-1-1)

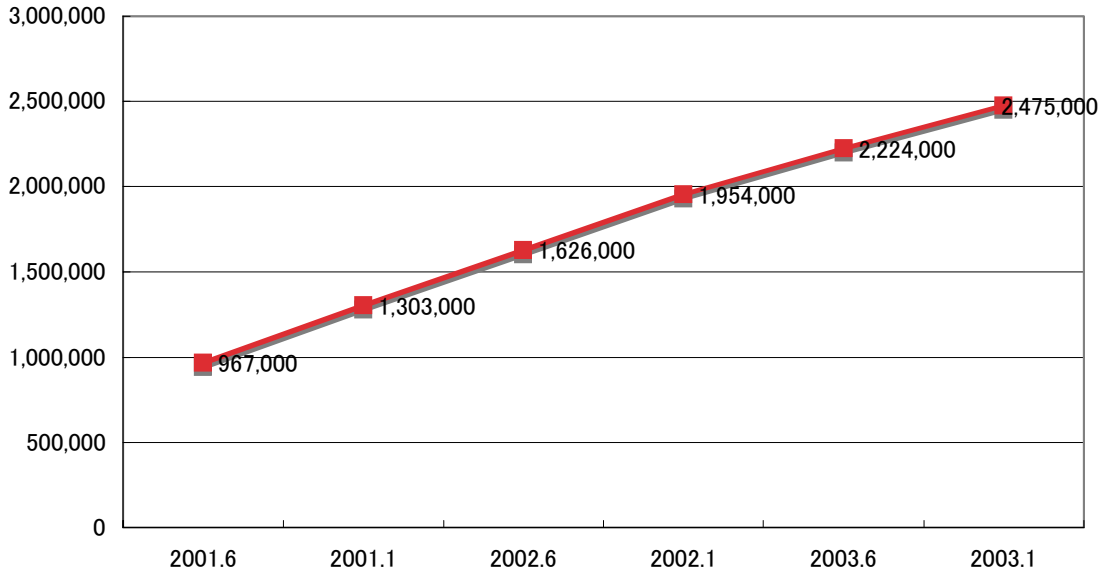

Fig. 20 Transition of number of CATV Internet providers (MIC, 2004, Fig.C-1-1)

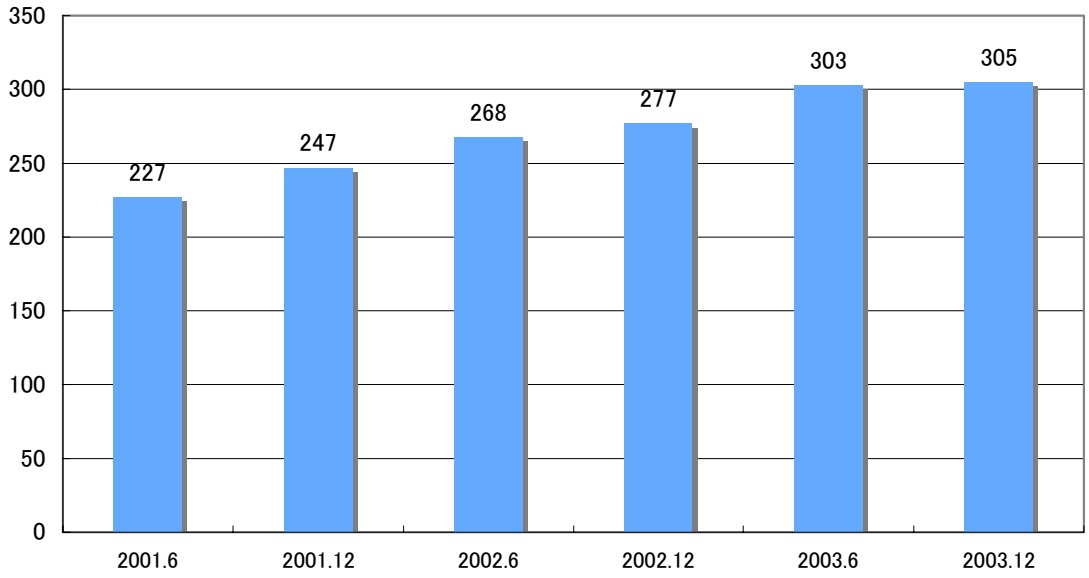

Fig. 21 International comparison of CATV Internet fares (MIC, 2004, Fig.C-1-4)

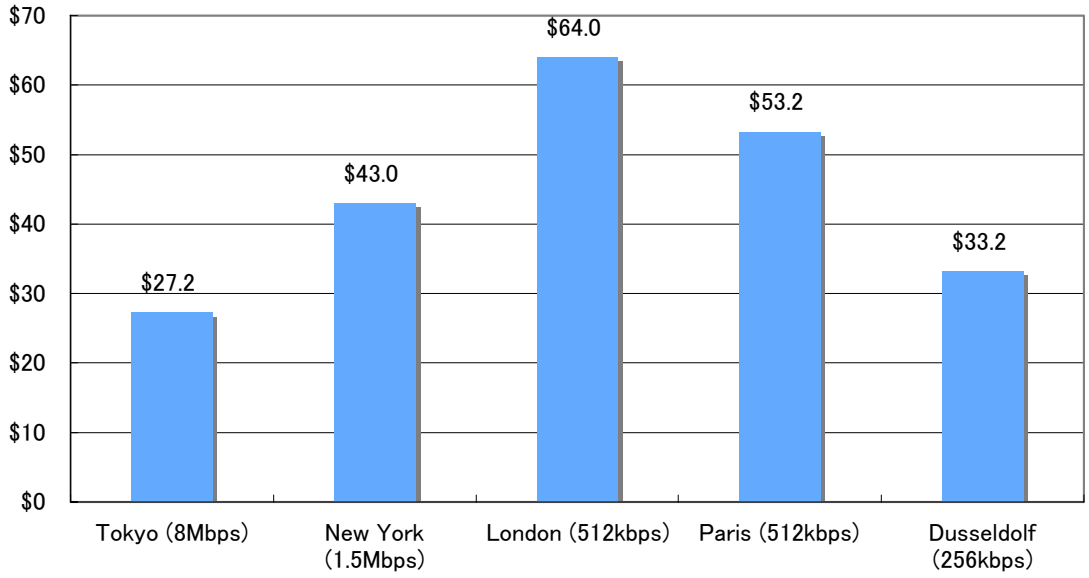

Fig. 22　Basic statistics of broadband markets (Ida and Kuroda, 2004, Table1)

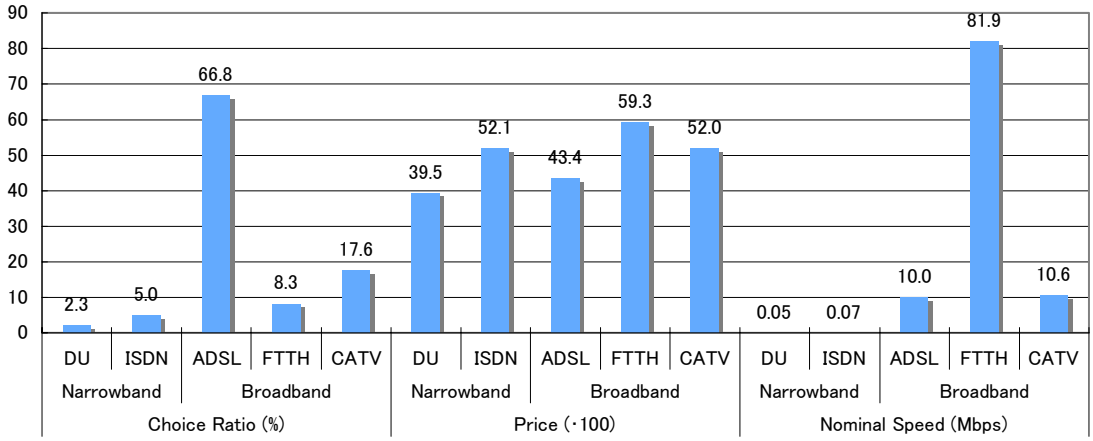

Fig. 23 Reasons for choosing Internet access service (Ida and Kuroda, 2004)

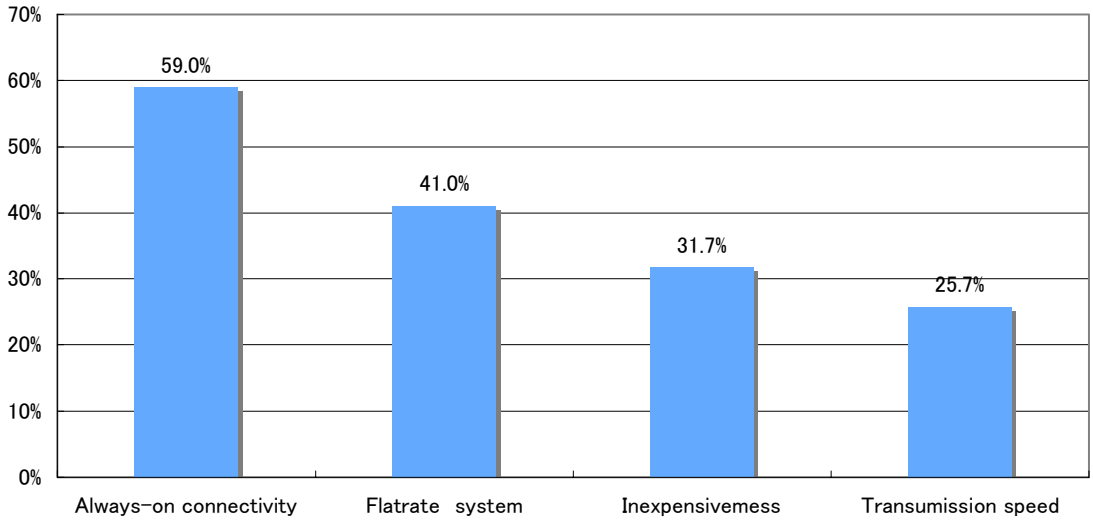

Fig. 24　Purposes for seeking Internet access (Ida and Kuroda, 2004)

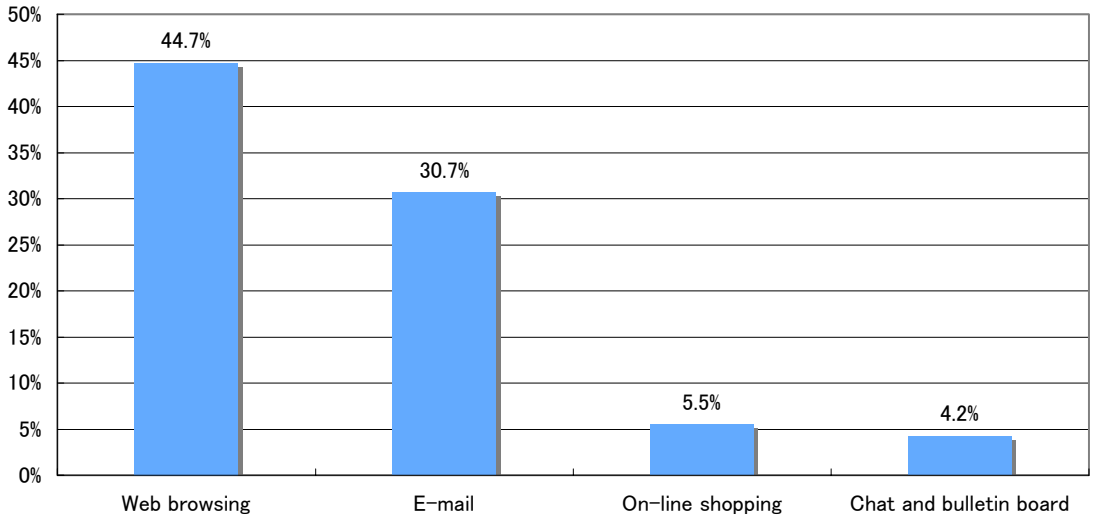

Fig. 25　Reasons for choosing Internet access provider (Ida and Kuroda, 2004)

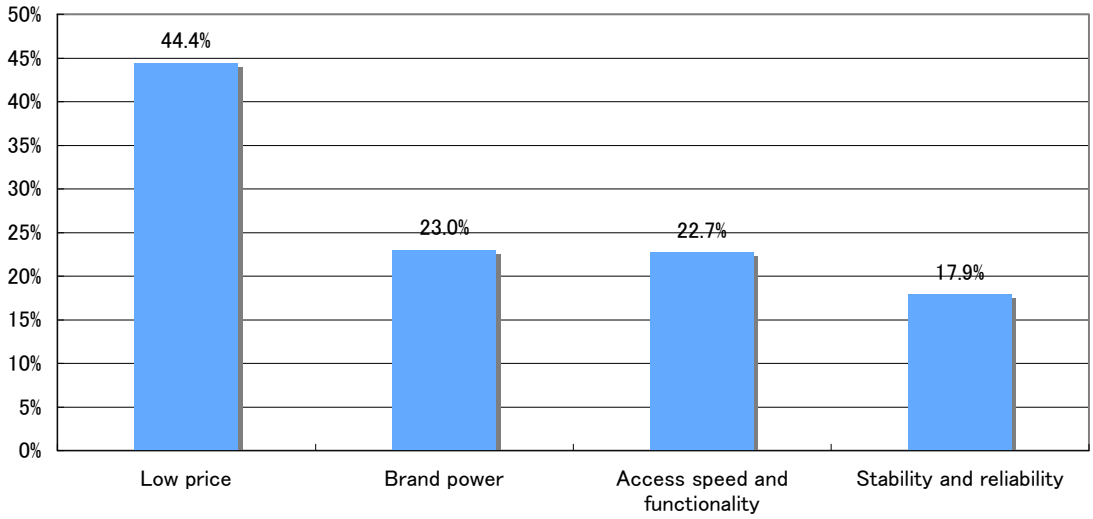

Table 1 Estimation results of a nested logit model of broadband services (Ida and Kuroda, 2004, Table4)

log L(ß)	-690.6425
log L(0)	-1367.8963
McFadden R^2	0.49363

parameters	coefficients	standard errors	t-values
fixed term (NB)	-1.66241	0.25424	-6.53879
fixed term (FTTH)	-1.65073	0.65805	-2.50853
fixed term (CATV)	-0.74102	0.31161	-2.37803
price	-0.00021	0.00006	-3.56811
nominal speed	0.0000043	0.0000041	1.04347
NTT dummy	17.82896	4155010	0.00000
IV (BB)	1.00000	0.35760	2.79645

Fig. 26 Own elasticities of broadband-access demand (Ida and Kuroda, 2004, Table4)

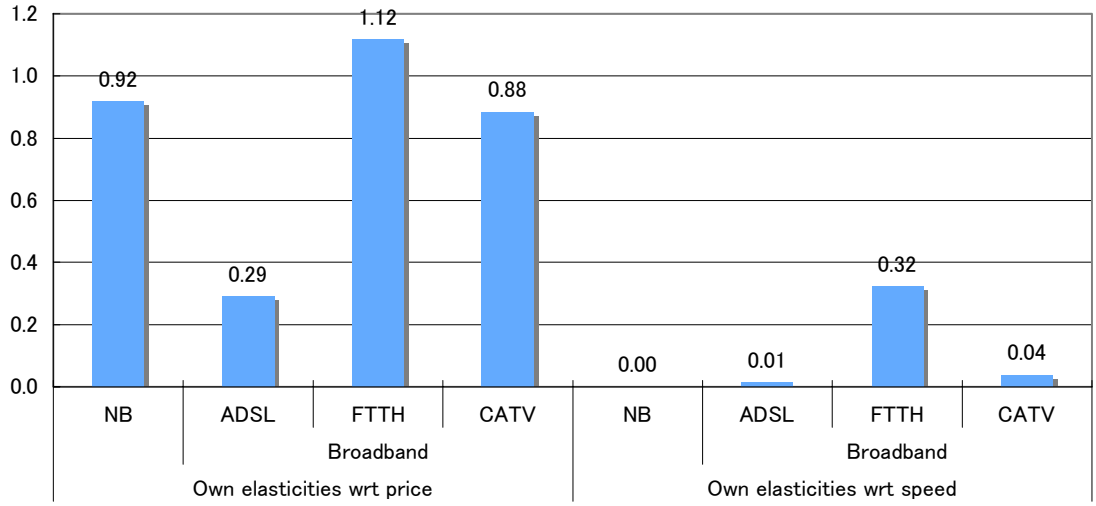

Fig. 27 Own elasticities of ADSL access demand (Ida and Kuroda, 2004, Table8)

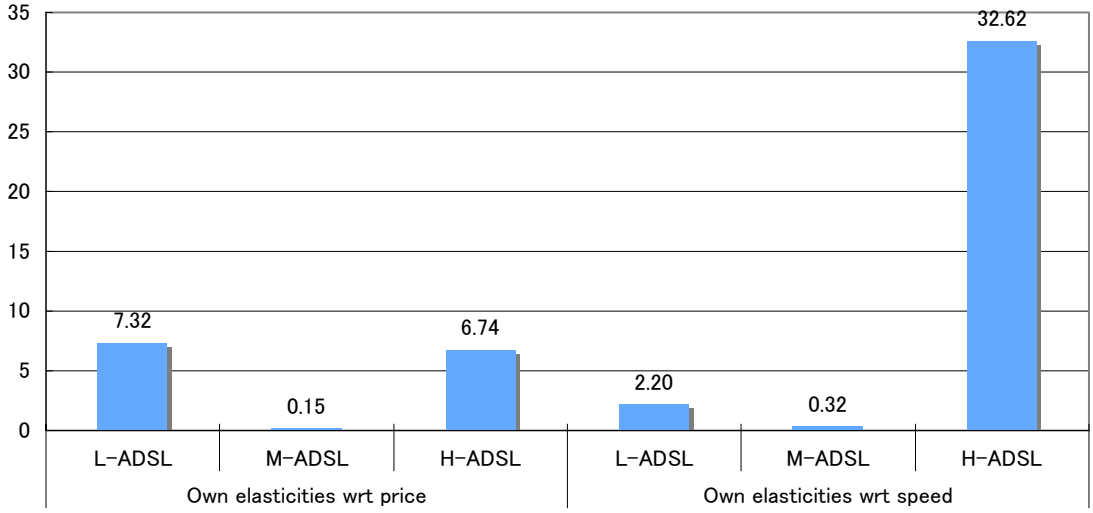

Table 2 Profiles of conjoint analysis (Ida and Sato, 2004, Table1)

Attributes	Levels					
Price	¥2,500	¥3,000	¥3,500	¥4,000	¥4,500	¥5,000
	¥5,500	¥6,000	¥6,500	¥7,000	¥7,500	
Access speed	1M	10M	20M	30M	100M	
IP telephony	Available	Unavailable				
TV programs	Available	Partially available		Unavailable		
Provider	NTT(East and West)		Non-NTT			
Symmetry	Symmetric	Asymmetric				

Fig. 28　Choice results of conjoint analysis (Ida and Sato, 2004, Table2,3,4)

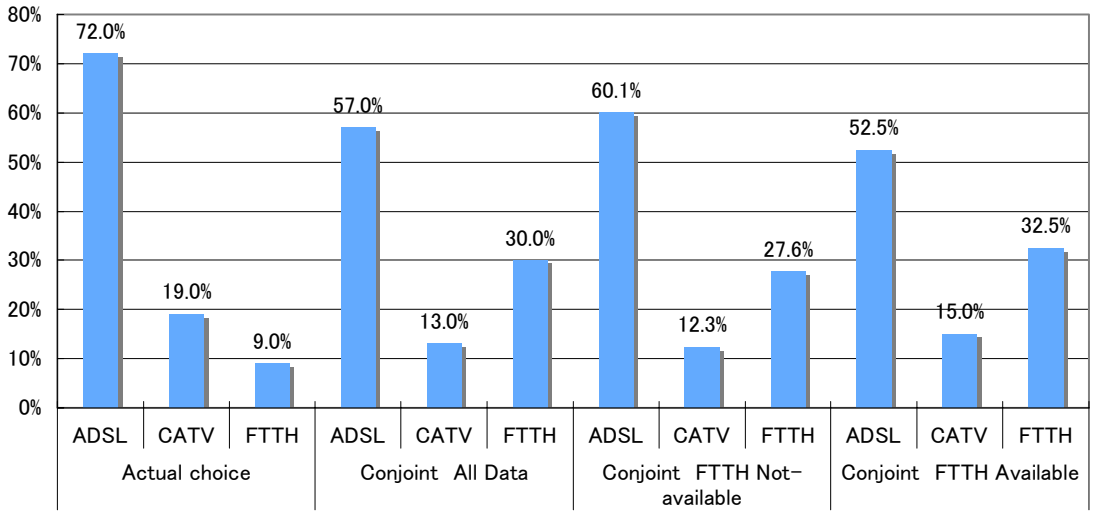

Fig. 29　FTTH availability and the speed WTP (Ida and Sato, 2004, Table6)

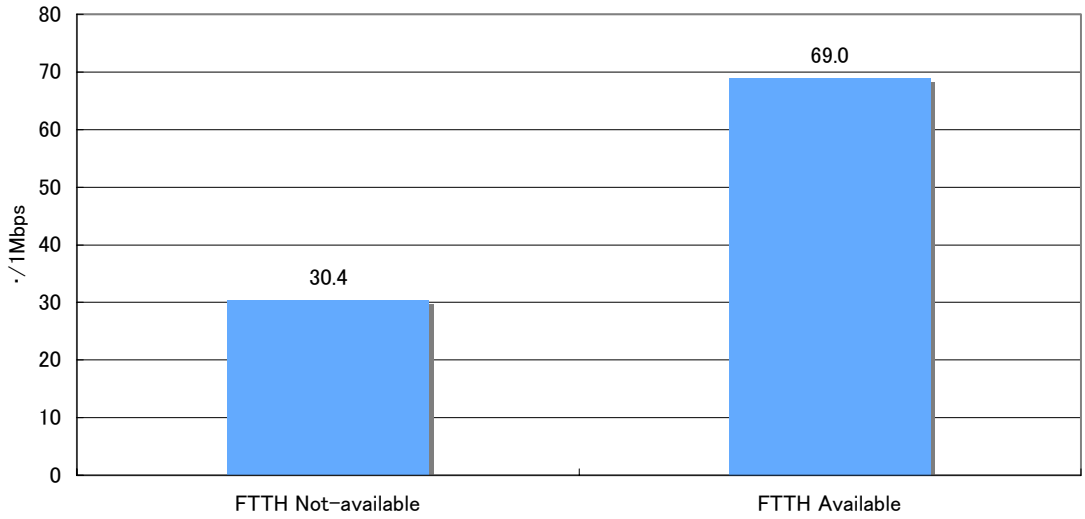

Fig. 30　Discrepancies between SP and RP (Ida and Sato, 2004, Table6)