

Telecommunications Indices in the Japanese CPI

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Abstract

This paper provides an outline of index compilation for telecommunications in the Japanese CPI.

In the CPI of Japan, telecommunications items comprise fixed telephone charges, mobile telephone charges and internet connection charges. These charges are differentiated for various services, and have changed rapidly with deregulation and technological innovation. For comparison with the same quality, indices for them are computed by using charges and subscriber numbers for different plans or lines supplied by providers.

At the 2005 revision, the weight decreased for fixed telephone charges but increased for mobile telephone charges, and prices of bundled plans for telephone and e-mail were newly aggregated for mobile telephone charge indices.

The paper also explains what happened to the indices with this revision, and discusses the scope for compiling methodology in future based on recent circumstances surrounding telecommunications.

Introduction

This paper¹ outlines recent movement in telecommunications services in Japan and methodologies to compile indices for telecommunications in the Japanese CPI, and discusses the challenges to improve the methodologies.

This paper first briefly introduces the current status and recent movement in telecommunications in Japan and methods of compilation of indices for the telecommunications. Next, it introduces movement of the indices for telecommunications. This paper also addresses issues which occurred at the last revision of the base of the CPI.

Focuses of this paper are interactive telecommunications such as telephone calls, e-mail and e-commerce, rather than simplex telecommunications such as broadcasting and automobile navigation.

1. Telecommunications Expenditure in Japan

The recent tendency of telecommunications in Japan is characterized by proliferation of

¹ The views expressed in this paper are those of the author's, and may not necessarily reflect the views of the organization to which he belongs.

users, diversification of services and price decline. This chapter introduces the summary of these characteristics.

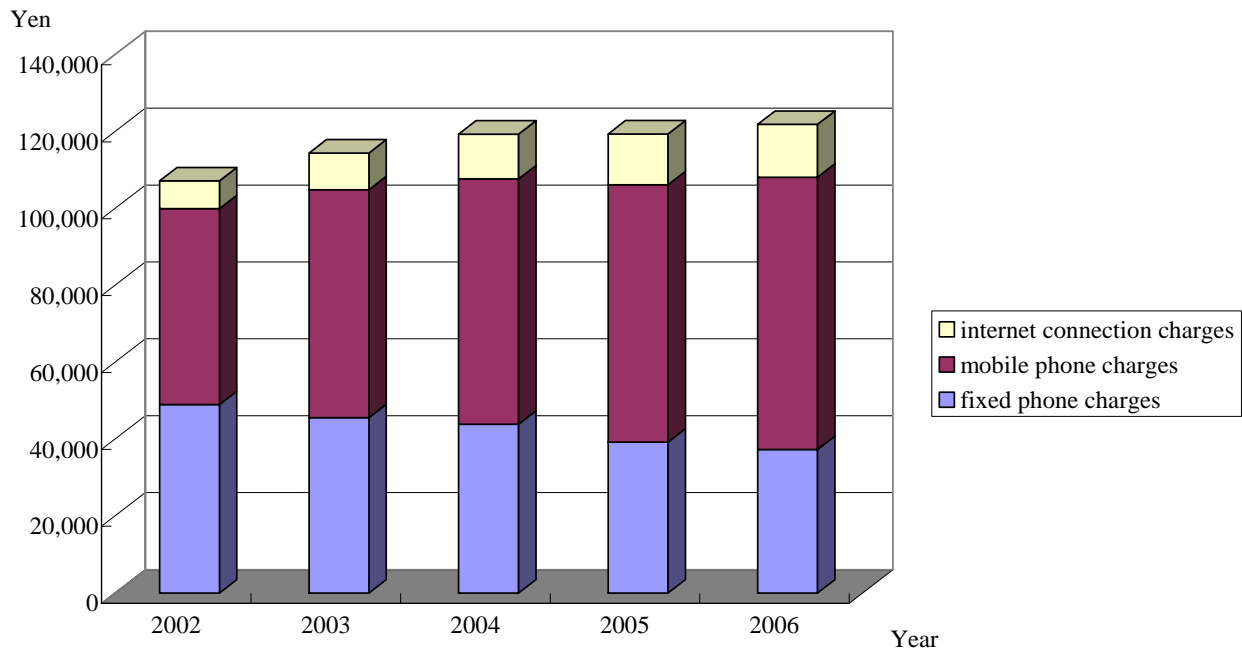
Telecommunications have developed dramatically in recent times, and various new modes of communication have emerged. As of the end of FY 2006, Japan has 97 million mobile phone subscribers and 34 million fixed phone residential subscribers, while 88 million people, 68.5% of the population, used the internet in 2006². Japan has the highest percentage of mobile broadband subscribers in the world. Although both frequency and duration of telecommunications by device have decreased, the number of devices for mobile phones has increased.

Most household expenditure for telecommunications is composed of fixed phone charges, mobile phone charges and internet connection charges. Combined they make up approximately four percent of total consumption expenditure, and have increased every year based on the FIES (Family Income and Expenditure Survey). Telecommunications charges per message unit are decreasing due to the deregulation and market competition, but total telecommunications charges paid per households are increasing. Opposing phenomena are occurring in fixed and mobile phones: that is, expenditure on fixed phones is decreasing, while that on mobile phones is increasing rapidly due to technological development, new attractive services with low rates, individualization and the decreasing size of households. (Figure 1) These phenomena are reflected in the weight of the CPI, which declined to two-thirds for fixed phone charges but tripled for mobile phone charges from the 2000 base to the 2005 base. Internet connection charges are also increasing.

Mobile phone charges include those for various services such as internet connection, e-mail, photos and video, direct marketing and file downloads as well as calls. Some of these charges are collected together as bundled services. Those for internet connection charges for fixed lines also include various services. If they are divided independently by their objectives, their relative importance is less than the threshold for adoption of a new CPI item³ for the CPI. For instance, download services are prevalent, but most of their charges are collected as part of internet connection charges except for the likes of special software, music or movies, whose charges were in total less than one ten-thousandth of total expenditure in 2005 at the newest base year. Watching television by mobile phone is not yet very popular and is supplied almost free or included in bundled services.

² The number and ratio of people who used the internet at least once in the year up to the survey date, including business use, based on the results of the Telecommunications Usage Trend Survey. If limited to only private use, the result of the Survey of Time Use and Leisure Activities shows 68 million people, 59.4% of the 10-years-and-over population, used the internet at least once in the year up to the survey date in 2006.

³ Items are selected by considering their relative importance to total living expenditure, with expenditures more than one ten-thousandth as a standard.

Figure 1 Expenditure for Telecommunications by Household

Source: Family Income and Expenditure Survey (Statistics Bureau)

A characteristic of the price system in the mobile phone market in Japan is cheap prices for devices and expensive charges for monthly services. This can be attributed to a practice among service providers and device suppliers by which providers pay about 40 thousand yen per device for “sales promotion” to sellers who discount devices to consumers, and compensate for these discounts as charges collected from consumers for services. Thus, expenditure on devices had been almost zero and was not large enough to be adopted as an item for the CPI until the 2005 base. This practice allows providers to supply high-value devices having advanced functions at discount prices by bundling devices and services, and promotes diversification of services and devices. This practice by sales promotion has, however, declined somewhat, and in the 2005 base expenses for devices have increased to a sufficient level to be counted as a CPI item⁴ while charges for services fell. In future, fierce competition in the global market are expected to cause this bundling practice to disappear completely and prices for devices will be higher, charges for services lower.

2. Outline of the Methodology Used to Compile Indices of Telecommunications Charges

For telecommunications charges, for which it is difficult to determine representative specifications for price comparison, the item indices are computed by using model formulae using the prices and number of customers or characteristics of plans supplied by providers, while most of the other item indices are compiled every month from the prices of the RPS (Retail Price Survey). Even so, indices for telecommunications services in the CPI in Japan are regarded to be compiled with representative-items-matched samples in the CPI Manual because prices used in the model formulae are representative in usage cases.

Main items for telecommunications are mobile phone charges, fixed phone charges and

⁴ Mobile phone devices are newly included in the CPI as an item on the 2005 base.

internet connection charges. This section outlines the scope of telecommunications and arithmetic formula for each item.

Scope of Telecommunications Services

The next table illustrates the scope of telecommunications services by device in the CPI in Japan. The main devices used in Japan to supply telecommunications services are mobile phones, fixed phones, personal computers and TV sets. These supply not only interactive services including calls, e-mail or access to entertainment⁵, but also simplex services including access to information, software downloads, or TV broadcasts.

Internet connection charges are in principle those for personal computers while those for mobile phones are included in the indices for mobile phone charges, and those for fixed phone charges in the indices for fixed phone charges. Internet connection to TV sets is not very prevalent yet in Japan but is included in the indices for internet connection charges. Charges for downloading software are included in the indices for internet connection charges if the software is basic or general. Additional charges are required if the software is special, but the total expenditure on them was not sufficiently large to be regarded as an individual item of the CPI. Access to entertainment also entails additional costs that do not take up a large share in the total expenditure.

Indeed, from the Survey of Use of Telecommunications in 2006, 11.6% of internet users in households purchased goods through internet, averaging 9,011 yen worth for the year through personal computers while 26.5% of internet users in households purchased goods worth 4,925 yen on average through mobile phones or PHS (Personal Handy-phone System). Of course, since most of the goods are books or printed matters sent by post, not software, their purchases cannot be categorized as telecommunications.

Though the expenditure on downloading software or other data contents by internet is still small and not included in the CPI, its inclusion has to be considered in the next rebasing of the CPI because it is rapidly growing.

Both mobile and fixed phone charges are included under the “communication” CPI item group along with postage, forwarding charges, and telephony devices, while internet connection charges are contained in “other recreational services”. Viewing broadcasted programs is prevalent in Japan, but is included in TV licenses, not in “communications” but in “other recreational services”.

There are some item categories other than general item groups in the CPI. A new memorandum item made by regrouping, “expenses for information and communication” was created at the 2005 revision, including mobile phone charges, fixed phone charges and internet connection charges.

⁵ Access to games, e-commerce, financial transactions, website construction, Second Life (moving a character or engaging in economic activity in a virtual space), and so forth

Table Scope of Services for Telecommunications by Device in the Japanese CPI

	Mobile Phone	Fixed Phone	PC
Call	O	O	
E-mail or Voicemail	O	O	O
Access to Entertainment	P		P

O Services are included in the CPI.

P Services are partly included in the CPI.

The following shows the specific methodologies of index compilations for mobile phone charges, fixed phone charges and internet connection charges.

Item level CPI for mobile phone charges

A mobile phone charge is normally composed of a subscriber line charge, call charge and charge for additional services whose share can be designated according to the will of users, and can be discounted for a fixed term contract, and further discounted if other family members are subscribers. Customer profiles are not disclosed or even available. Thus, when compiling the indices for telecommunications, representative charges are chosen based on distribution of expenditure by household.

The quoted model usage cases are (a) 20 minutes of calltime plus 4,100 packets of data exchange, (b) 200 minutes of calltime plus 11,300 packets, and (c) 660 minutes of calltime plus 23,400 packets. In Japan, as there are only three major mobile phone providers, the index for mobile phone charges is compiled using charges from these three providers.

The index of mobile phone charges I_t is calculated using the following formula.

$$\frac{I_t}{I_{t-1}} = \frac{\sum_{i,j,k} P_{t,ijk} Q_{t-1,ijk}}{\sum_{i,j,k} P_{t-1,ijk} Q_{t-1,ijk}}$$

In this formula, P is the representative charges for the above three model usage cases, Q is the number of subscribers, t is the month, i is the plan, j is the provider (among the three major providers), k is the category of plan (2G or 3G⁶). All data for the formula are supplied by providers. Charges for use of the internet through mobile phone are included in the charges. The formula is uniform for the whole country.

The basic concept of the formula has remained the same since the 2000 base when the mobile phone was introduced.

Item level CPI for fixed phone charges

The index of fixed phone charges⁷ is calculated with subscriber numbers as weights and charges separately for NTT (Nippon Telegraph and Telephone)⁸ lines and other lines. The charges

⁶ The 2G is the second generation, personal digital cellular. The 3G is the third generation, international mobile telecommunications-2000.

⁷ The index for fixed phone charges was first published in 1955.

⁸ NTT is the dominant telephone service provider in Japan. There are a few other providers, which has a

are composed of subscriber line charges and call charges. The call charge P_t is calculated using the following formula.

$$\frac{P_t}{P_0} = \frac{\sum_{i,j,k,l} \frac{V_{0,ijkl}}{T_t} \times C_{t,ijkl}}{\sum_{i,j,k,l} \frac{V_{0,ijkl}}{T_0} \times C_{0,ijkl}}$$

In this formula, V is total call duration, T is possible call duration per message, C is charge per unit, t is the month, 0 is the base year, i is the charge plan, j is the provider, k is the distance zone, and l is the time zone. P_0 is the average call charges in a month on the base year, which is estimated based on the FIES. The index is compiled by municipality. Some data needed for the formula such as frequency and duration of calls for different time zones in a day are supplied by providers under a special agreement to keep them strictly confidential for compilation of the index.

Recently, phone charges for IP (Internet Protocol) subscribers have risen as a share of fixed phone charges, being less than 10% in 2004, but exceeding 20% in 2007. Thus, from January 2008, IP phone charges will be included in the index of fixed phone charges through a procedure reflecting public comments. The line specification is assumed to be a 0ABJ⁹-IP line, because 0ABJ-IP lines have increased more than NTT lines, other lines or 050¹⁰-IP lines recently, and in addition, it is difficult to capture charges for 050-IP lines separately since 050-IP lines are services to use by attaching to internet connection services mainly through ADSL-lines or paying additional charges as options.

The IP phone index will be compiled separately and consolidated using the number of subscribers as weights with the index for fixed phone charges, because IP phones are in principle connected to the internet, and charges are the same regardless of distance or duration if calling to a fixed phone or another IP phone, unlike the regular system of fixed phone charges.

The 0ABJ-IP line is used with internet, entailing (a) internet connection charges, (b) subscriber line fees and charges to use trunk communication lines and the terminal equipment such as routers and (c) calling charges. Among these, (a) and charges for use of an edge line set or in-house line in owner-occupied houses in (b) are excluded since they are included in the internet connection charges. The index of IP phone will be compiled as charges to fixed phones by calculating with the formulae shown above for fixed phones, because IP phones are used mainly for calling to fixed phones.

Item level CPI for Internet Connection Charges

Internet connection charges include fees for basic services through internet as well as fees for connection to internet. The index of internet connection charges is calculated with the share of

share of approximately 10% of all.

⁹ Dial numbers are designated by service or use and composed of nine numbers beginning from 0 in the format "0AB~J". ("I" is not used as it is confused with "1".)

¹⁰ An 050-IP line is a service provided mainly through ADSL by adding to the internet connection service or paying additional fees as options.

subscribers as weights and charges by provider for lines with a high volume of users, that is, analog lines, ISDN lines, ADSL lines and fiber optic cables. The index is compiled for each municipality. A charged service is available mainly with personal computers or TV sets, but only rarely with fixed phones.

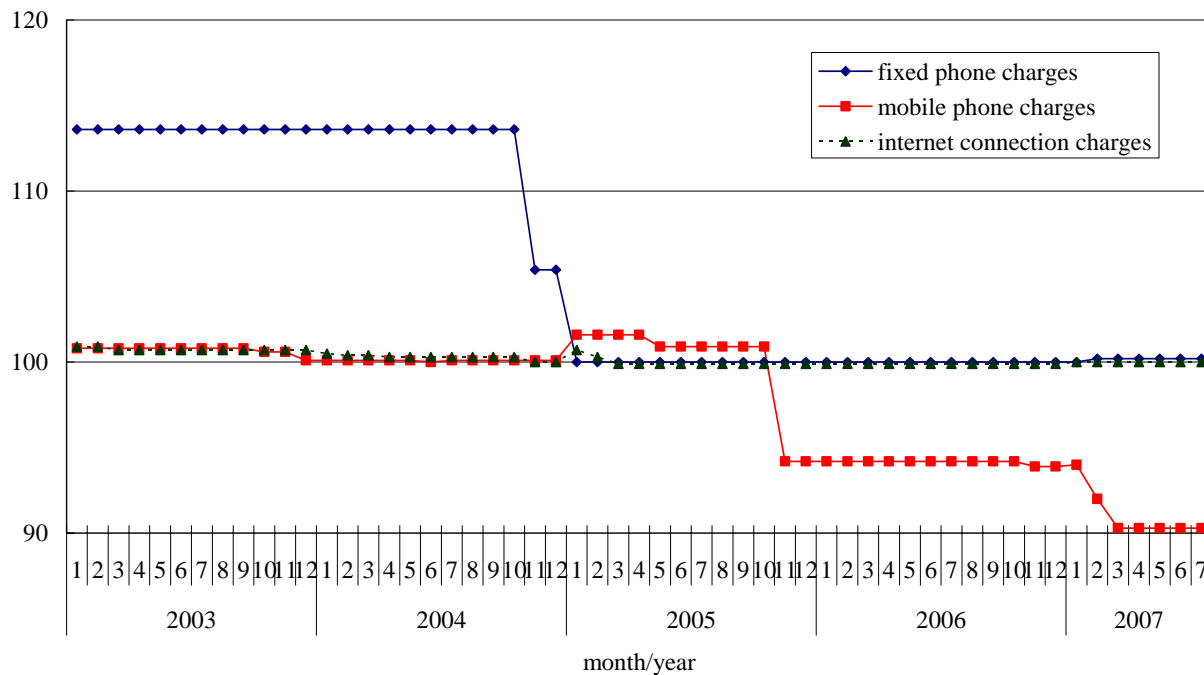
Most data for the formula are disclosed to the public by providers. Share of use by type of line, however, is calculated using data from the Survey of Household Economy. The formula has been the same since the introduction of the item in the 2000 base.

3. Recent Movement of Indices for Telecommunications

With deregulation, market competition and technological innovation, telecommunications charges have fallen. As the market is shared by a small number of companies, changes in any one provider's charging plan have a substantial influence on the index, especially on the change over the previous year of the CPI. Moreover, these providers normally revise their charging plans abruptly without notice, with an aim to attract new customers by playing up the drastic discounts with big advertisements. The impact on such charges of the CPI is therefore regarded as a "surprise" by policy makers and economists. Figure 2 shows the movement of recent indices for telecommunications.

Fixed phone charges fell in November 2004 and January 2005. Mobile phone charges fell considerably with a charge revision by one of the providers in November 2005, and the introduction of new discount plans from another in February and March 2007. Internet connection charges, by contrast, stayed at almost the same level.

Recently, changes in mobile phone charges have been a main focus in the CPI in Japan because its contribution to the all-item CPI is comparatively large. The contribution by the new plans in February and March 2007 to the change over the previous year of the CPI is -0.08 points, which is significantly large in comparison with the annual change of the CPI, which has hovered around zero for the past four years.

Figure 2 Indices for Telecommunications 2005=100

There are criticisms that the index may include a downward bias because it assumes that all the users changed their plans to the lowest-priced plan in the months when discounted services first appeared. There are also opposite criticisms that the index may include an upward bias because discounted services tend to be disregarded in the index compilation. However, such criticisms cannot be confirmed or quantitatively assessed because of the lack of the detailed data in regard to the shift of users.

Japan's telecommunications charges have become relatively lower in the world due to the recent drops. According to an international comparison based on the FY 2006 Survey on Rate Variances between Domestic and Overseas Telecommunications Services, the charges in Tokyo were the lowest among major cities in the world, if the comparison is made on the basis of 1Mbps internet connections, and an average level for phone calls.

4. Influence of the 2005 Revision on Indices

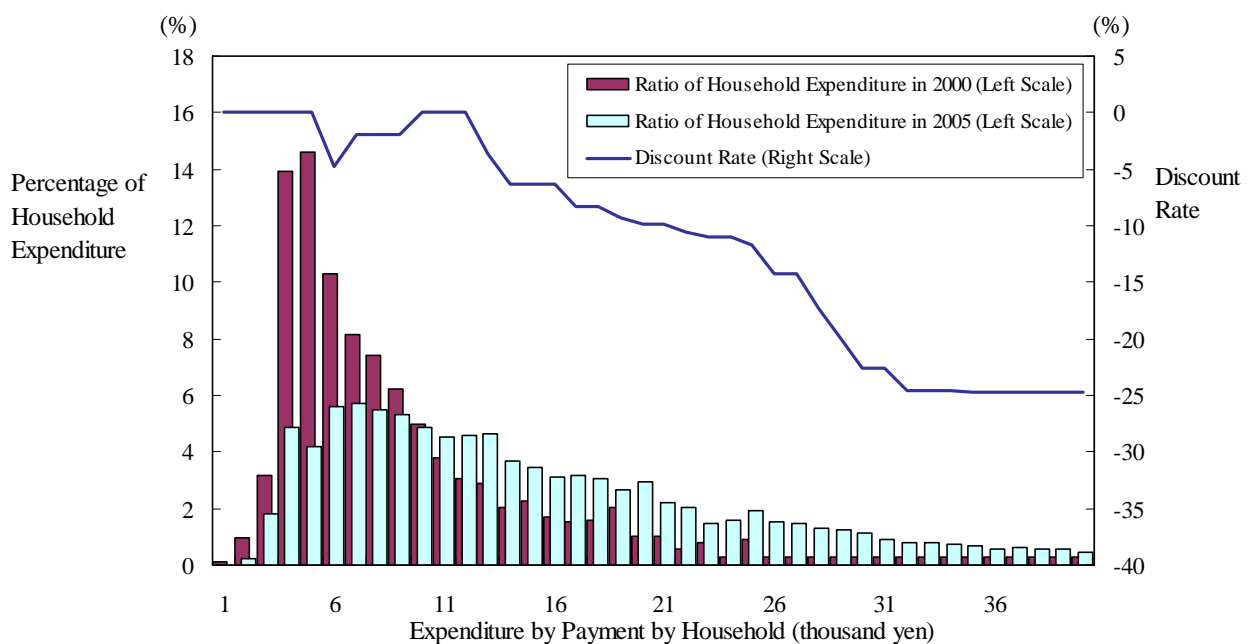
Contents of services, charge system and users for telecommunications are changing. It is important but difficult to capture them continuously and accurately, and reflect swiftly them for compilation of the CPI. This section introduces one issue happened at the 2005 revision of the CPI, when the pricing items of the RPS and the content of the model formulae were renewed.

In the rebasing of the CPI from the 2000 base to the 2005 base, the change of the mobile phone charges in 2006 of the 2005 base over the previous year was about 0.11 percentage points lower than the 2000 base. This decline of the CPI change can be attributed mainly to (a) the pattern of the discount of the mobile phone rates newly introduced by a service provider and (b) the change of mobile phone uses in the households from 2000 to 2005. As for (a), in November 2005, one of the providers introduced a new charging plan giving higher discount rates for a larger volume usage.

As for (b), the use of mobile phones increased rapidly from 2000 to 2005, and the percentage of the households having high-volume use of mobile phones significantly increased from 2000 to 2005. With the combination of (a) and (b), a larger decline of mobile phone charges for the high-volume users were more strongly related in the 2005 base than in the 2000 base.

In the 2000 base CPI, the model usage cases used for index calculation were 10 minutes, 80 minutes and 340 minutes of calling time on the 2000 base. But in the 2005 base CPI, the model usage cases were changed to 20 minutes calltime plus 4,100 packets, 200 minutes calltime plus 11,300 packets and 660 minutes calltime plus 23,400 packets in a month. These model usage cases were determined to reflect the three categories of households as an equal size grouped on the basis of volume of use of mobile phones: lower use, medium use, and higher use. For each category, a medium usage pattern was selected as the model usage case. The data of household expenditure distribution by the mobile phone expenditure was taken from the FIES by a special tabulation. As Figure 3 illustrates, the distribution in 2000 had a peak at 4,000-5,000 yen monthly, but in 2005, the peak flattened out so that the share of the household expenditure with higher expenditure increased.

Figure 3 Distribution of Household Expenditure and Discount Rate for Mobile Phones



Source: Family Income and Expenditure Survey (Statistics Bureau)

Note: Discount rate refers to the ratio of the mobile phone charge as of November to October 2005 for a provider.

Other than this, some small changes were included at the revision of the base. For example, 3G was included to reflect its prevalence, and subscriber line charges were excluded since they cannot be designated owing to the diversification of services. In the 2005 base, consumers are assumed to choose the lowest-priced plan to gain the same service level. In addition, the area was enlarged from eight prefectures in and around Tokyo and Osaka to the whole country, due to diminishing differences in charges among regions.

The contribution of the change to the all-item CPI had been -0.01 in the old base, but was

-0.05 in the new base as of July 2006¹¹ if calculated with the weight of the old base. But the actual contribution in the 2005 base proved to be -0.14, because the weight in the new base is three times larger than that in the old base.

For fixed phone charges, on the other hand, charges for lines other than NTT were included for the first time in the formula at the revision of the base, but their influence was so small that the contribution did not change between the old and the new bases. The formula for internet connection charges was kept to be the same in the revision.

5. Conclusions

The telecommunications indices are compiled with data provided from the major providers. If these data are arranged for the purpose of index compilation, accuracy of the indices will be improved. These providers, however, arrange data for their own purposes, some of which are proprietary secret due to the competition with their rival providers. Even so, it is beneficial that user profiles accumulated by these companies be supplied to the Statistics Bureau in strict confidence exclusively for the use of index compilation. Fortunately, the Statistics Law was fundamentally revised for the first time in 60 years, and the provisions concerning the compulsory gathering of data for compilation of the main statistics has been reinforced. It is hoped that such provision will be effectively applied for data gathering and compilation of the CPI.

In the coming CPI revision of 2010, more efforts have to be made to avoid the kind of “surprise” for users that caused by mobile phone charges at the 2005 revision. But some gaps are expected to be inevitable regardless of all the efforts because the rapid shift in telecommunications users that has emerged in the past five years is expected to continue. Therefore, it is necessary to provide users with various sorts of information containing details of the model formulae that may help predict the gap in the next revision in order to minimize the “surprise” to the market.

From the view to reduce the “surprise”, it is better to revise model usage cases more frequently because volume of use in households is rapidly increasing. Especially revision of the model usage cases of mobile phone charges every year is necessary, based on data summed from individual household questionnaires of the FIES, to reflect recent circumstances as fast as possible to compilation of the CPI, though it will need much more resources for compilation of the CPI.

On the other hand, innovation in communication methods is so drastic that the products and services will be changed or bundled dynamically. For example, devices combining the functions of a personal computer and mobile phone have appeared in the market. Moreover in future, there will be an integrated service covering phones, personal computers and TVs. It is crucial to identify and follow such tendencies and their charging systems. If a new-style product or service proliferates and its sales reach a sufficient level to count as an item, they should be included in the CPI. It will require tremendous effort to construct a relationship with other items and create a new methodology to compile the index, including the quality adjustment since it will be closely associated with other products or services long-established and rooted in society.

¹¹ The current series of the CPI with the 2005 base was first published in August 2006, when the retroactive revision of the CPI was performed for the period from January 2005 to July 2006.

Finally, it is beneficial for experts of the CPI to exchange information internationally in order to catch up with development of telecommunications services and to enhance methodologies to compile indices.

References

<http://www.stat.go.jp/>

Statistics Bureau, 2005-Base Explanation of the Consumer Price Index, December 2006

Statistics Bureau, 2000-Base Explanation of the Consumer Price Index, March 2002

Management of Internal Affairs and Communications, 2007 White Paper Information and Communication in Japan

Meeting for a Review on Mobile Business, Report of the Meeting for a Review on Mobile Business, for Realization of an Open Mobile Business Environment, 26 June, 2007

ILO/ IMF/ OECD/ Statistical Office of the European Communities/ UN/ The International Bank for Reconstruction and Development/ The World Bank, Consumer Price Index Manual: Theory and Practice, 2004

Makoto Shimizu, Quantitative Evaluation of the 2005 Revision of the CPI in Japan, International Statistical Institute 56th Session, Lisbon, 22-29 August, 2007

Telecommunication Bureau, Management of Internal Affairs and Communications, FY 2006 Survey on Rate Variances between Domestic and Overseas Telecommunications Services, 28 August, 2007