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Price Setting in Japan: Evidence from CPI Micro Data

Masahiro Higo*
masahiro.higo@boj.or.jp

Yumi Saita**
yumi.saita@boj.or.jp

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Bank of Japan
2-1-1 Nihonbashi Hongoku-cho, Chuo-ku, Tokyo 103-8660

* Research and Statistics Department

** Research and Statistics Department

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Masahiro Higo* and Yumi Saita†

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Abstract

This paper investigates the price-setting behavior in Japan by using the CPI micro data in the Retail Price Survey from 1989 to 2003. We establish the four facts as follows. First, the frequency of price changes for goods is high while that for services is low. The frequency of price changes for goods has increased during the 1990s while that for services has greatly decreased. Second, many items have a downward sloping hazard function while some have the flexible-type or the Taylor-type hazard function. Third, in most of the categories in the CPI, a decline in the frequency of price changes has contributed to the drop in the CPI inflation rate since the 1990s while the size of price changes has remained roughly unchanged. Fourth, the heterogeneity in the frequency of price changes across categories and its evolution are strongly influenced by the differences in the share of labor costs in the production costs and changes in the firm's price strategy regarding temporary sales.

Keyword: Consumer Price Index, Price-setting, Price stickiness, Frequency of price changes, Hazard functions, Time-dependent pricing, State-dependent pricing

JEL classifications: E31, D40, C41

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* Research and Statistics Dept., Bank of Japan; e-mail:masahiro.higo@boj.or.jp
† Research and Statistics Dept., Bank of Japan; e-mail:yumi.saita@boj.or.jp

1. Introduction

The nature of price-setting behavior has important implications on a wide range of issues in macroeconomics. One of the most important issues is that the degree of price stickiness influences the nature of business cycles. If prices are sticky, prices do not adjust immediately in response to various shocks. While price stickiness stabilizes the volatility of prices, it increases the volatility of real output. Sakura, Sasaki and Higo [2005] find that in Japan, while the real growth rate has been fluctuating since the 1990s, the inflation rate has remained stable. Price stickiness may be one of the causes for this phenomenon.

Another important issue is that price stickiness distorts resource allocation. When heterogeneity in price stickiness across individual products exists, relative prices between sticky-price and flexible-price products change in response to shocks. The change in the relative prices distorts the resource allocation and entails a social welfare loss. The magnitude of the social welfare loss depends on the degree of macro price stickiness and the amount of heterogeneity in the price stickiness across individual products. In addition, whether price stickiness is time-invariant (time-dependent pricing) or time-variant (e.g. state-dependent pricing) determines the extent of the loss.

There are two approaches to investigate price-setting behavior. One is to conduct an interview survey of firms. Blinder et al.[1998] find that in the US there are large differences in the frequency of price changes among firms or items, and the median firm adjusts prices about once a year. Bank of Japan [2000] finds, based on a questionnaire survey of 630 firms, that firms most commonly change prices once or twice a year in Japan.

The other approach is to use micro data underlying the consumer and producer price indexes. Bils and Klenow[2004] show that the average frequency of price changes for the US CPI is around 25 percent per month, which is larger than the frequency obtained by the firms survey. The Eurosystem Inflation Persistence Network investigated price-setting behavior by using micro data in most of the euro countries. Its findings are as follows. First, the average frequency of price changes is 15 percent per month. Second, the frequency varies across products, with very frequent changes for energy products and unprocessed food, and relatively infrequent changes for non-energy industrial goods and services. Third, price decreases are not uncommon even when the inflation rate is positive. Fourth, the size of price changes is 8 to 10 percent, which is much larger than the prevailing inflation rate.

Recently Nakamura and Steinsson [2007] reported interesting stylized facts as follows. First, when sales are excluded, the average frequency of price changes for the US CPI is

only between 9 and 11 percent per month, which is almost the same as the frequency given in the firms' survey. Second, one third of price changes are price decreases. Third, the frequency of price increases responds to inflation while the frequency of price decreases and the size of price changes do not. Fourth, the hazard function of price changes for individual products is downward sloping for the first few months and then flat. The first, second and third facts are consistent with a benchmark menu-cost model they propose.

In this paper, we analyze the frequency of price changes, hazard rate of price changes, survival ratio of prices and the size of price changes using the micro data from the Retail Price Survey, which is used for compiling Japanese consumer price index. This is the first attempts in Japan to directly measure price-setting behavior using micro data in Japan.

The paper is organized as follows. In section 2, we explain the characteristics of the micro data we use and the measurement methodologies. In section 3, we measure the frequency of price changes to show the heterogeneity in the frequency between goods and services and across categories, and the development of the frequency since the 1990s. In section 4, we estimate the hazard rate and the survival ratio of items. In section 5, we analyze the relationship between the frequency and the size of price changes and the changes in the CPI inflation. In section 6, we examine the determinants of the price-setting behavior such as the share of labor costs in the production costs and changes in price regulations and the firm's price strategy regarding temporary sales. In section 7, we summarize our findings.

2. Data and Measurement Methodology

(1) Retail Price Survey

We use data set from the Retail Price Survey conducted by the Statistics Bureau, Ministry of Internal Affairs and Communications. In the Retail Price Survey the Bureau surveys retail prices of goods and services every month. The CPI is constructed using the price data in the Retail Price Survey. The Retail Price Survey, therefore, is the most suitable statistics to analyze the price-setting behavior in Japan's CPI.

(2) Characteristics of the Data

(i) Selection of Items

We use 493 of 598 CPI items, 372 out of 456 items for goods and 121 out of 142 items for services; (CY 2000 base)(Chart 1(1)). In this analysis, the following items are excluded

from our data set.

a. Items whose price data are not used for constructing CPI

b. Items whose price data are partly missing because they are seasonal items

c. Items whose price data are compiled from a large number of prices by each survey city

d. Items whose price data has only short time-series (e.g. only available from January 2002)

For goods, automobiles, personal computers, and seasonal items of textiles, are excluded. For services, house rent, imputed rent, medical treatment, airplane fares, telephone charges and mobile telephone charges are excluded (Chart 1(2)).

(ii) Coverage

Our data set covers 68 percent of the CPI total weight. The coverage is high for goods at 84 percent, but low for services at 51 percent (Chart 2). This is because house rent and imputed rent, which have large shares in the CPI, are excluded. Consequently, the share of goods is 63 percent in the data set, which is higher than the actual share in the CPI (51 percent).

(iii) Surveyed Prices

In the Retail Price Survey, identical items are surveyed at the outlets in each city. The Bureau surveys prices of goods and services every month. In addition, temporary price cuts within seven days are excluded so that the data set is not influenced by short-term sales.

(iv) Number of Samples for Each Item

The data are city averages of individual prices across outlets. Our analysis is based on 55 cities (Chart 3(1))[1]. We, therefore, have 55 city average price data for each item per month. For example, a price of an identical refrigerator is surveyed at three outlets in each city. The Bureau averages three prices and publishes the city average price of the refrigerator. Thus, data at individual outlet level are not open to public. The number of survey outlets in each city is around three on average; 2.7 for the CPI total, 2.9 for goods and 2.4 for services[2] (Chart 3(2)).

[1] The Bureau surveys prices in 167 cities, towns and villages every month. Among them, 71 city average price data are published. The number of survey outlets varies by item and by city. In particular, the sample size in large cities is sizable compared with that in small cities. We, therefore, exclude the data of 16 major large cities and only use the data of 55 middle-sized cities with a prefectural government or a population of at least 150,000 people. More precisely, according to the changes in the number of survey cities, our data set includes 52 cities for 1989-1993, 54 cities for 1994-1998 and 55 cities for 1999-2003.

[2] The number of samples is just one for public services, electricity, gas and water charges and

(v) Sample Period

This data set contains prices from January 1989 to December 2003. The sample period starts with the bubble period when the inflation rate was around three percent per year. In the mid-1990s the inflation rate gradually declined to zero percent and it stayed between minus one and zero percent after the late 1990s.

(3) Measurement Methodology

We measure four indicators for each item: frequency of price changes, hazard rates, survival ratios and size of price changes. We construct aggregate statistics by taking weighted average using the weights of the household expenditure used for the CPI compilation[3].

(i) Frequency of Price Changes

The frequency of price changes is a basic indicator to show price stickiness. This is calculated for each item as a fraction of the number of survey cities where prices change. When the frequency is high, price stickiness is low, and vice versa. Since the frequency fluctuates greatly month by month we construct annual averages as well as five-year averages for 1989-1993, 1994-1998 and 1999-2003.

The prices in our data set are the averages of survey outlets and do not necessarily correspond to individual prices. The average price changes when one or more outlets change their prices. Therefore, the observed frequency of price changes has an upward bias. Given this bias, the frequency measured in this paper is not suitable for an international comparison. We however can analyze the development of the frequency or the differences in the frequency across categories within a country because the average number of samples are constant (around three) over the sample period for each item.

(ii) Hazard Rate and Survival Ratio

Hazard rate of price changes at period t is defined as the conditional probability that a price is changed in period t given that the price has never changed until period t-1[4].

(Hazard rate at period t) = (the number of price changes at period t) /
(the number of prices which have never changed until period t-1)

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publications because in these categories products are monopoly-controlled or their prices are identical by regulations in each city.

[3] The weights we use are CPI weights from 1990 base for the period 1989-1993, 1995 base for the period 1994-1998, and 2000 base for the period 1999-2003.

[4] See Appendix 1 for the estimation method for hazard rates in detail.

The hazard rate enables us to distinguish whether prices change randomly or not, and whether prices become more or less likely to change the longer they have remained unchanged. The shape of the hazard function is flat if prices change randomly. It is upward sloping if prices become more likely to change the longer they have remained unchanged and is downward sloping if they become less likely to change.

Survival ratio of prices at period t is defined as a fraction of the prices which remained unchanged until period t. It can be estimated from hazard rate as below.

(Survival ratio at period t) = (1-hazard rate at period 1)×……×(1-hazard rate at period t-1)×(1-hazard rate at period t)

The survival ratio is a good indicator to show how long prices remain unchanged; in other words, how large the price stickiness is. It also shows the degree of the distortion in resource allocation, which considerably depends on the survival ratio. We estimate those measures for each of three periods (1989-1993, 1994-1998, and 1999-2003).

(iii) Size of Price Changes

Inflation rate is defined as a product of the frequency of price changes and the size of price changes. Here we examine whether the frequency or the size of price changes is more responsive to a change in the inflation rate. If the price-setting is time-dependent (e.g. Calvo [1983]), the frequency remains unchanged and size of price changes responds to the change in the inflation. On the other hand, if the price-setting is state-dependent (e.g. typically, menu cost models), it is the frequency of price changes that responds to the change in the inflation in many cases.

Next, we observe the distribution of the size of price changes for individual items to distinguish whether the lower bound in the size of price changes exits or not. The existence of the lower bound means that adjusting prices accompanies a cost and that the prices are not changed unless the merit of the price changes exceeds the cost. In this case, as the desirable inflation approaches to zero the frequency of price changes declines. If we find the existence of the lower bound in the size of price changes, we can support the menu-cost-type price-setting behavior.

(4) Definition of Price Changes

For each item by survey city, when the current month's price is different from the previous month's price, we consider a price change occurs in the current month. We however do not consider the following two case as price changes even when observed prices do change.

(i) Revision of Specifications

We discard price changes resulting from the Revisions of Basic Specifications[5], implemented nationwide by the Statistics Bureau. With this treatment we consider the price difference between old specifications in the previous month and new specifications in the current month attributes to the difference in quality.

(ii) Introduction of Consumption Tax and Change in the Tax Rate

We discard price increases owing to the introduction of the consumption tax rate (at the rate of three percent in April 1989) and the revision of the tax rate (increased from three to five percent in April 1997). The increases in prices passed on, however, may not exactly match the increase in the tax rate. We, therefore, assume that price increases for (tax rate increase $\pm$ 0.5 percent) are not considered as price changes[6].

It is also important to note that price changes resulting from changes in survey outlets as price changes because the Retail Price Survey provides no information on the revisions in outlets[7]. This approach is consistent with the procedure of compiling the CPI, in which price changes resulting from revisions in outlets within the survey region are directly reflected to changes in the index.

3. The Frequency of Price Changes

In this section we examine the frequency of price changes. First, we examine characteristics of the frequency across goods and services as well as individual categories by looking at the five-year averages of 1999-2003. Next, we examine the development of the frequency from 1989 to 2003.

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[5] Among the revisions of specifications under the Retail Price Survey, minor revisions implemented because the stipulated basic specification is no longer sold at survey outlet are viewed as price changes. This treatment is consistent with Dhyne et al.[2006], which analyzes the EU countries.

[6] <April 1989>
(Frequency of price changes): changes from the previous month of 2.5 to 3.5 percent are not defined as price changes.
(Size of price changes): the size of the price changes is calculated by subtracting 3 percent from the actual size.
<April 1997>
(Frequency of price changes): changes from the previous month of 1.44 to 2.44 percent are not defined as price changes.
(Size of price changes): the size of price changes is calculated by subtracting 1.94 percent from the actual size.

[7] According to the analysis by the Statistics Bureau, the percentage of price changes attributed to the changes in the survey outlets was approximately 12 percent from July 2003 to June 2005, which does not have a large impact on the observed frequency of price changes .This is because the Retail Price Survey continuously surveys prices at the same outlets as long as they remain representative.

(1) Cross-sectional Characteristics of the Frequency of Price Changes

First, we find a large difference in the frequency of price changes between goods and services. Chart 4(1) shows the five-year average of the frequency of price changes for 1999-2003. The frequency for the CPI total is 21.4 percent per month. For goods it is high at 31.1 percent per month while for services it is low at 4.5 percent per month.

Chart 4(2)(3) indicate that there is a huge amount of heterogeneity across categories. For example, the frequency for fresh food is the highest at 91.1 percent per month while the frequency for public services related to transportation and communication is the lowest at 0.3 percent per month. The highest frequency is three hundred times larger than the lowest. In Chart 5(1), we confirm that the distribution of the frequency of price changes by individual items has a large dispersion across items.

Chart 5(2) presents an international comparison of the frequency of price changes following Dhyne et al.[2006][8]. There are differences in the frequency across the main components of the CPI not only in Japan but also in the US and the EU. The differences in Japan, however, are much larger than those in the US and the EU.

Next, we look at the frequency of price increases and decreases separately. Chart 6 shows that the frequency of price increase is almost equivalent to that of price decrease in this period, when the inflation rate stayed around zero percent.

(2) Development of the Frequency of Price Changes from 1989 to 2003

(i) Results

The frequency of price changes has varied over time. For the CPI total, the frequency slightly declined from 1989 to 1994. It began to gradually rise after 1995 and its pace accelerated from 2000 (Chart 7(1))[9].

The frequency of price changes for goods has increased since the 1990s (Chart 7(2)). Chart 8 shows the development of the frequency by category in goods. The frequency for electricity, gas and water charges greatly jumped in 1996 and 1997, owing to the introduction of the fuel price adjustment system, whereby prices change every quarter to pass on the changes in fuel expenses to consumers. Additionally, the frequency of price changes for food products and other industrial products has increased. The increase in the

[8] For more details, see Appendix 2.
[9] The temporary rise in the frequency of price changes in 1997 is due to the increase in the consumption tax rate. Some firms raised prices less than the tax rate hike. The frequency in 1989, when the consumption tax was introduced, temporarily increased for the same reason.

frequency for goods, however, is not in line with the decrease in the inflation for the CPI goods.

The frequency of price changes for services declined during the 1990s and it began to rise slightly from 2000(Chart 7(3)). The decrease in the frequency for services during the 1990s is parallel to the decline in the inflation for the CPI services. Chart 9 shows that the declines in the frequency for eating out and general services related to domestic duties are conspicuous while the frequency for public services has remained stable during this period. As we observe the development of the frequency of price increases and decreases separately (Chart 10), the frequency of price increases has greatly dropped along with the decline in the inflation of the CPI services. The frequency of price decreases, however, has remained unchanged showing no correlation with the inflation.

(ii) Interpretation of the Results

There are various factors which affect the frequency of price changes. For goods the introduction of the fuel price adjustment system and deregulations of prices are important factors which increase the frequency. For services, the change in the frequency of price changes has a positive correlation with the change in the inflation rate. Furthermore, the change in the frequency of price increases has a strong correlation while that in price decreases does not. This result for services is consistent with the US CPI evidence reported in Nakamura and Steinsson[2007]. The above evidence suggests that the price-setting behavior for both goods and services is not time-dependent. For services, we find some evidence for the state-dependent price-setting.

4. The Hazard Rate and Survival Ratio

In this section, we estimate the hazard rate and survival ratio of price changes to further examine the price-setting behavior. First, we observe cross-sectional characteristics for goods and services as well as individual categories based on the five-year average hazard rate and survival ratio for the period 1999-2003. Next, we examine the time-series development for the periods 1989-1993, 1994-1998 and 1999-2003.

(1) Cross-Sectional Characteristics for Goods and Services

(i) Results

Chart 11 shows the hazard rate of price changes and survival ratio of prices for the CPI total, goods and services for 1999 to 2003. The hazard rate of goods is relatively high

compared with that of services and steeply downward sloping with a peak at duration of one month. The survival ratio of goods greatly declines over time and reaches 22 percent at 12 months. These results indicate that prices of goods are flexible.

The hazard rate of services is low throughout the period and the shape of the hazard function is moderately downward sloping with large peaks at 6, 12, and 24 months. The peak at 12 months is conspicuous showing that quite a few service prices change once a year. The survival ratio for services gradually declines over time and reaches 58 percent at 12 months and 46 percent at 24 months. These results indicate that prices of services are very sticky. We can conclude that there is a large heterogeneity between goods and services in the hazard rate and the survival ratio.

(ii) Interpretation of the Results

A downward sloping hazard function is observed in many countries[10]. This fact implies that prices become less likely to change the longer they have remained unchanged. The existing price-setting models, however, cannot explain the downward sloping hazard function. For example, the Calvo model assumes a flat hazard function, while typical menu cost models (Caplin and Spulber[1987], Dotsey, King and Wolman[1999]) assume an upward sloping hazard function. However, even if the hazard functions of all the items are flat or upward sloping, the aggregate hazard function can be downward sloping. For instance, Alvarez et al.[2005] show the aggregate hazard may become downward sloping when considering multiple Calvo-type items with different hazard rates[11].

(2) Cross-sectional Characteristics By Item

(i) Results

Next, we estimate the hazard functions by item and classify them into three types as follows (Chart 12).

(Type 1: Flexible type)

Flexible-type items have extremely high hazard rates since the prices are flexible and mostly changed every month. The survival ratio sharply drops to zero percent at three months. Items of this type are most of the items in fresh food, eggs and cut flowers (Chart 12(1), Chart 13(1)). None of the item in services appears in this type.

[10] For the US, Klenow and Kryvtsov[2005], and for Euro Areas, Baudry et al.[2004],Veronese et al.[2005], Baumgartner et al.[2005], Aucremanne and Dhyne[2005].
[11] Enomoto[2007] generalizes the Golosov-Lucas model (Golosov and Lucas[2007]), a single sector menu cost model with idiosyncratic productivity shocks, to a multi-sector setting so that he can confirm empirical evidence such as a downward sloping hazard.

(Type 2: Downward-sloping type)

Downward-sloping-type items have a peak in the first month (Chart 12(2)). The shape of the hazard is similar to that of the aggregate hazard function. The hazard rate of this type is lower than that of flexible-type, reflecting that prices are relatively sticky. Items of this type are most of the items in goods except for fresh food and electricity, gas and water charges, and majority of items in general services (eating out, services related to domestic duties and reading and recreation).

Looking into the downward-sloping type hazards, we find two patterns depending upon the level of hazard rates. For example, many of the goods items show a sharp downward sloping hazard function with a high hazard rate at duration of one month (Chart 13(2-1)). In contrast, many of the services items show a moderate downward sloping hazard with a low hazard rate in the first month (Chart 13(2-2)).

(Type 3: Taylor type)

Taylor-type items (Taylor [1979]) have hazard functions with large peaks at 6, 12, and 24 months (Chart 12(3)). This type includes electricity, gas and water charges, most items in public services, all items in general services related to medical care and welfare and education and some items (lesson fee) for general services related to reading and recreation (Chart 13(3)). Their prices mostly change every April or October[12].

(ii) Interpretation of the Results

We find that the shape of the hazard function at the disaggregated level is also downward sloping. Heterogeneity should not exist in the price data for a single item in the Retail Price Survey because the Statistics Bureau surveys an identical product for each item. However, there are large differences in the frequency of price changes across survey cities even for an identical item[13]. One possible reason for this is that each survey city has a different composition of outlet types. The type of outlets varies from supermarkets and discount stores, which frequently change prices owing to their price strategy including sales, to convenience stores and general merchandise retail outlets, which change prices infrequently. In this case the shape of hazard functions for individual item also becomes downward sloping.

In fact, items sold in various types of outlets have a sharply downward sloping hazard

[12] For some items in Taylor type such as Lesson fees, the timing of price changes does not correspond to fiscal year.
[13] For instance, the average frequency of price changes for food product is 29.9% while its standard deviation is 19.5%, showing a large variance in the frequency across cities.

reflecting the differences in price-setting strategies across outlets. In contrast, service items provided only by sole proprietors have a moderately downward sloping hazard. These facts suggest that the heterogeneity in price-setting behavior of individual outlets gives rise to a downward sloping hazard function.

Regarding the shape of hazard functions, Ikeda and Nishioka [2007] report different results by using the same data[14]. They conclude that hazard function at the disaggregated level can be classified into four groups; (1) flexible type, (2) Taylor type, (3) increasing-hazard type and (4) Calvo type (flat-at-low-probability type). Their results raise an interesting point that there is no item with a downward sloping hazard and it is highly likely that the downward sloping hazard functions appear as a result of aggregating several hazard functions of those four types.

(3) Changes in the Hazard Rate and Survival Ratio

We compare the hazard rates and survival ratios for the two periods; 1989-1993, when the inflation rate was high at three percent per year and 1999-2003, when the inflation rate was low between minus one and zero percent per year.

The shape of the hazard function of goods is sharply downward sloping with a peak in the first month (Chart 14(2), Chart 15(1)(a)). The difference of the two periods is that the hazard rate at short duration shifted upwards in 1999-2003. This indicates that an increase in short-cycle fluctuations led to the increase in the frequency of price changes for goods. Meanwhile, the survival ratio greatly declined in 1999-2003. These facts show that prices for goods became more flexible in the past ten years.

In contrast, the hazard rates of services dropped in 1999-2003 at all durations and survival ratios greatly increased (Chart 14(3), Chart 15(1)(b)). These facts show that prices for services increased the degree of rigidity in the past ten years. It is apparent that the difference in price-setting behavior between goods and services has expanded recently.

At the disaggregated item level, we find the shape of hazard functions for some items having changed from the Taylor type to the downward-sloping type. They reflect either the decline in the inflation or the change in price regulations between the two periods. The existing pricing models cannot easily explain the above complicated facts.

[14] In their analysis the sample period differs from ours; they use CY 2000-2004 sample.

5. The Size of Price Changes

In this section, we look into the detail of the size of price changes. First, we show the statistics on the size of price changes. Second, we investigate whether the frequency of price changes or the size of price changes contributes to the change in the inflation rate. Third, we examine the price-setting behavior revealed by the distribution of the size of price changes.

(1) The Average Size of Price Changes

First, we look into cross-sectional characteristics of the price changes using data for the period 1999-2003. Next, we compare the average size of price changes between 1990[15]-1993 and 1999-2003.

(i) Cross-Sectional Characteristics

On the CPI total, the average size of price increases is 6.5 percent, while that of decreases is 5.6 percent (Chart 16(1)). These figures are quite large taking into account the fact that the inflation rate was near zero during the sample period. Looking at the individual categories, we see only a slight difference between goods and services, while we see considerable differences across items within goods and services categories. Looking into the goods category, the average size of price changes is relatively large for fresh food, other industrial products and textiles while it is small for petroleum products and electricity, gas and water charges (Chart 16(2)). Among services the average size is relatively small for public services related to education and general services related to education and medical care and welfare (Chart 16(3)).

(ii) Changes in the Size of Price Changes from 1990-1993 to 1999-2003

For the CPI total, goods and general services, the average size of price changes remain roughly unchanged during the period from 1990-1993 to 1999-2003 (Chart 17(1)). In contrast, the average size of price changes declined considerably for public services and also general services related to education and medical care and welfare (Chart 17(3)).

(2) Which Contributes to Disinflation, the Frequency or the Size?

Next, we analyze what factors contribute to the change in the inflation rate. Specifically, we decompose the change in the inflation rate between the two periods, 1990-1993 and 1999-2003, into the change in the frequency of price changes and the change in the size of

[15] We exclude data of 1989 from calculating the size of price changes because not only the introduction of the consumption tax but also the change in the special tax rates on luxury commodities and liquor in 1989 distorts the size of price changes.

price changes.

i) Results

For the CPI total a rise in the frequency of price decreases explains 60 percent of the fall in the inflation rate and a decline in the size of price increases explains remaining 40 percent (Chart 18(1)). We can conclude that the two factors above have nearly equal degree of contributions to the inflation.

For goods, both a rise in the frequency of price decreases and a fall in the size of price increases have almost the same contribution to the decline in the inflation rate. It is ambiguous whether the frequency or the size of price changes has a larger contribution to the disinflation.

Looking into the categories within goods (Chart 18(2)), we find that a rise in the frequency of price decreases shows the largest contribution, while a change in the size of price increases/decreases shows a relatively small contribution for most of the categories except for fresh food, petroleum products and electricity, gas and water charges. We conclude that the contribution of the change in the frequency of price changes dominates that of the change in the size for most of the categories in goods.

For services, a fall in the frequency of price increases largely contributes to the disinflation, while a change in the size of price changes contributes little (Chart 18(1)). Looking into the categories within services (Chart 18(3)), we find that a fall in the frequency of price increases greatly contributes to the disinflation for many categories as well. We also find that for public and general services related to education and medical care and welfare, the contribution of a fall in the size of price increases is also considerably large, showing nearly equal contribution as a fall in the frequency of price increases.

(ii) Interpretation of the Results

Factors responding to a change in the inflation rate vary depending on the price-setting behavior. If the price-setting is time-dependent the frequency of price changes remains unchanged and the size of price changes responds to the change in the inflation. On the other hand, if the price-setting is state-dependent, it is often the frequency of price changes that responds to the change in the inflation.

According to the above results, prices for fresh foods, petroleum products, electricity, gas and water charges, and public and general services related to educations and medical care and welfare have the features of both time-dependent and state-dependent price-setting.

In contrast, prices for most of the other categories in goods and services have the features of state-dependent price-setting. We, therefore, examine a relationship between the decomposition of the change in the inflation rate and the shape of the hazard functions. As a result, we find that most items with downward-sloping-type hazard functions follow the state-dependent pricing, while the items with flexible-type or Taylor-type hazard functions follow both of the time-dependent and state-dependent pricing.

(3) Frequency Distribution of the Size of Price Changes by Item

We find some evidence that the majority of items have the features of state-dependent pricing. If prices are adjusted following the typical menu-cost model, which is one of the state-dependent pricing models, we can assume that a lower bound in the size of price changes exists because prices are not adjusted unless the merit exceeds the cost of changing prices. In this case, we are sure to observe a dip nearest to zero in the distribution of the size of price changes.

(i) Results

We find that the individual items' distributions of the size of price changes can be classified into two groups by their shapes (Chart 19). The first group has a lower bound in the size of the price changes so that the distribution dips near zero percent[16] with twin peaks at 2-10 percent away from zero. The second group does not have any bound in the size of price changes; therefore, the distribution does not show a substantial dip near zero percent.

Chart 20(1) shows the share of items judged to have dipped near zero. In many categories, such as food product, other industrial products, a few of public services and most of categories for general services, more than half of the items have a distribution with a dip. These items have a lower bound in the size of price changes so that prices are changed in a lump.

In contrast, in some categories such as petroleum products and electricity, gas and water charges, most of categories for public and general services related to education and medical care and welfare, there is no dip nearby zero percent in the distribution suggesting that prices are changed even for an extremely small size.

(ii) Interpretation of the Results

Next, we examine the relationship between the existence of a lower bound in the size of

[16] See Appendix 3 for the criteria for judging whether an item has a dip nearby zero in the frequency distribution of the size of price changes.

price changes and the degree of the contribution of a change in the frequency of price changes to the change in the inflation rate. Chart 20(2) shows the correlation between the share of items judged to have a dip nearby zero and the share of contribution of a change in the frequency of price changes to the change in the inflation rate. It indicates that there is no clear correlation between two variables for goods, but a strong positive correlation for services. For services items with a lower bound in the size of price changes, the frequency tends to respond to the change in the inflation while the size remains unchanged. We have seen various empirical evidence that prices in Japan follow the state-dependent price-setting behavior especially those for services[17].

6. What Influences the Price-Setting Behavior in the CPI?

Thus far we have seen the heterogeneity in the price-setting behavior across categories in terms of the frequency of price changes, the shape of hazard functions, and their time-series developments. Specifically, the frequency of price changes is high for goods and low for services. The shape of the hazard functions for most goods items are flexible type or downward-sloping type, while that for services items is downward-sloping type or Taylor type. Let us now consider the underlying factors contributing such heterogeneous price-setting behaviors.

(1) The Influence of the Share of Labor Costs

One possible explanation for the difference in the price-setting behavior between goods and services is a degree of the labor cost share in the production costs. We calculate the share of labor costs for each item using the CY 2000 Input-Output Table[18]. We find that the labor share of goods is small ranging from 2 to 25 percent, while it is large ranging from 35 to 78 percent for services.

(i) The Share of Labor Costs and the Frequency of Price Changes

First, we look at the relationship between the share of labor costs and the frequency of price changes by category. Chart 21(1) presents a negative correlation between them; the frequency of price changes declined as the share of labor costs rose. A similar negative

[17] Ikeda and Nishioka [2007] conclude that the price-setting behavior is considered to be consistent with the time-dependent pricing model, applying the variance decomposition proposed by Klenow and Kryvtsov [2005] to the same price data.

[18] In this paper, labor cost is defined as a sum of employee compensation and operating surplus. Labor cost share is the labor cost divided by domestic production measured in purchasers' prices. The rationale for including operating surplus is that it includes the labor cost of individual proprietors, most of which are in the service industry. In more detail see Appendix 4.

correlation is found for individual items as well (Chart 21(2)). Since the labor costs change less frequently than other costs, it is considered that prices for services, whose labor costs have a large share in the production costs, need not to change frequently while prices for goods, whose labor costs have a small share in the production costs, do. For goods production costs are largely determined by their input prices of raw and intermediate materials, which are volatile.

Furthermore, looking at the relationship between the share of labor costs and the change in the frequency of price changes, we find that a degree of a fall in the frequency of price changes from 1989-1993 to 1999-2003 was greater for categories with a higher share of labor costs (Chart 22(1)). A similar relationship is also found for individual items (Chart 22(2)). These results reflect the fact that since the 1990s the fluctuations in the production costs have become smaller along with a fall in the wage growth rate (Chart 23). This suggests that the stabilization of the change in the wages enhanced the price stickiness for services.

(ii) Share of Labor Costs and Shape of Hazard Functions

Next, we look at the relationship between the share of labor costs and the price-setting patterns revealed by the shape of hazard functions. Chart 24 shows that the larger the share of labor costs the more of the items show Taylor-type price-setting patterns. In Japan wages are commonly reviewed once a year so that the wage-setting behavior tends to be Taylor-type. Thus, the result suggests that the services items with a high share of labor costs adopt the Taylor-type price-setting according to the wage-setting behavior. Consequently, the level of the share of labor costs significantly links to the shape of hazard functions.

(iii) Share of Labor Costs and Downward Nominal Price Rigidity

Another notable aspect of the share of labor costs is the relation to downward nominal price rigidity. Here we define items with downward nominal price rigidity as items whose frequency distributions of the size of price changes skew to the right and whose prices rarely decrease, but once the price drops its magnitude tends to be large. In Chart 25, the frequency distributions of the size of price changes show a presence of downward nominal price rigidity in 1989-1993 for many items in general services. In 1989-1993, the downward nominal price rigidity is observed in almost all items with the labor shares of 70 percent or higher, and in more than half of the items with the shares of 50-70 percent. In contrast, no downward price rigidity is observed for items with low shares of labor costs.

For many of the services items, the downward nominal price rigidity was still observed in 1994-1998. It, however, disappeared for almost all items in 1999-2003. These facts line up well with the findings by Kuroda and Yamamoto [2005] that downward nominal wage rigidity was no longer observed after 1998. We can conclude that the wage-setting behavior has a great influence on the price-setting behavior for services.

(2) The Influence of Changes in Price Regulation and Firm's Price Strategies

Now we consider possible factors that influence the frequency of price changes. During the 1990s, the frequency for goods rose, while that for services declined. The rise in the frequency for goods, however, seems to contradict the fall in the aggregate inflation. One possible explanation is that changes in the market structure such as the change in price regulations and firm's price strategies regarding sales influenced the increase in the frequency of price changes for goods.

(i) Regulatory Changes: Price Liberalization and Changes in Price-Setting Rules

Since the 1990s, the frequency of price changes for rice, cosmetics and automobile insurance premiums has been rising owing to the progress in the price liberalization. For electricity and gas charges, the frequency of price changes greatly rose around 1996 due to the introduction of the fuel price adjustment system. In this manner, changes in the price-setting rule increased the frequency of price changes for some items, especially utility charges.

(ii) The Change in Firms' Price Strategies Regarding Temporary Sales

The frequency of price changes has been rising steadily since the latter half of the 1990s for food products and other industrial products. This fact may reflect an increase in temporary sales with durations exceeding seven days which are not excluded from the price data in the Retail Price Survey. Chart 26(1) shows that the share of retail outlets making temporary sales has been rising in recent years. According to the National Survey of Family Income and Expenditure the share of purchases at supermarkets and discount stores has also been rising in recent years (Chart 26(2)). Chart 26(3) presents for food product items, the relationship between a change in the frequency of price changes and a change in the share of purchases at supermarkets or discount stores from 1989-1993 to 1999-2003. We can see a positive correlation between them whereby an increase in the frequency of price changes is large for those items whose proportion of purchases at supermarkets and discount stores has been sharply rising.

Temporary sales and other price strategies are exploited quite often for the goods items such as food products and other industrial products. Service providers can easily differentiate their customers by adopting non-linear pricing or individualizing customer services, and thus have little incentive to adopt temporary sales. For goods, however, firms recognize the effectiveness of temporary sales as a customer differentiation strategy. This difference in firms' price strategies may cause the heterogeneity in the price stickiness between goods and services.

(iii) Increase in the Frequency of Temporary Price Changes

From the above findings, it is conceivable that the frequency of price changes rises just because of an increase in temporary sales inducing no permanent price changes. We now examine the assumption by two approaches.

First, we compare the shape of hazard functions between 1989-1993 and 1999-2003. We find that the hazard rates of goods for durations from 1 to 6 months rose (Chart 15 and Chart 27). It shows that an increase in the short-cycle fluctuations partly led to the increase in the frequency of price changes for goods.

Second, we estimate an autoregressive model for each item and examine the resulting impulse responses[19]. This allows us to judge how long a price shock remains leading to a permanent shift in the price level. For many categories in goods such as food product and other industrial goods, the impulse response declines sharply indicating that prices return to their initial level quickly. This means that price shocks for goods do not tend to result in a permanent shift in the price level. In contrast, for many categories in services, the impulse responses decline only slightly. This means that a shock remains for quite a long period because prices do not return to the initial price level quickly. For services, therefore, changes in prices tend to shift the price level permanently (Chart 28).

In conclusion, a part of the increase in the frequency of price changes in many categories for goods is attributable to the increase in temporary sales. The result implies that, if we could exclude the temporary sales from the price data, the frequency of price changes might not rise. We, therefore, conjecture that the fall in the price stickiness for goods does not correspond to a response to the business cycle.

[19] The detailed estimation method is explained in Appendix 5.

7. Conclusion

In this paper, we analyze price-setting behavior in Japan by using the CPI micro data of the Retail Price Survey from 1989 to 2003. Our findings are as follows.

First, we find that the frequency of price changes for goods is high while that for services is extremely low. The heterogeneity between goods and services as well as across categories is larger than that in the US and the EU. Also the frequency of price changes is time-variant; it has increased for goods and has decreased for services since the latter half of the 1990s. It shows that the heterogeneity in the frequency of price changes between goods and services has expanded.

Second, we observe the heterogeneity in the shape of hazard rates of price changes and the survival ratio. The hazard function for goods is steeply downward sloping with a peak in the first month, while that for services is moderately downward sloping with a large peaks at 6, 12, and 24 months. The survival ratio for goods is much lower than that for services. These findings show that there is a large difference in the price stickiness between goods and services. Moreover, we observe the shape of hazard functions by item and classify them into three groups; flexible type: fresh food, Taylor type: public services and some categories of general services (education and medical care and welfare), and downward-sloping type: the remaining items. Thus, the shape of hazard functions for individual items is time-variant and its characteristics are so complicated that the existing literature hardly explains it.

Third, we examine the factors affecting the change in the inflation rate between the two periods, the bubble period (1990-1993) and the zero-inflation period (1999-2003), by decomposing the inflation rate into the change in the frequency of price changes and the change in the size of price changes. In many categories with downward sloping hazard functions, the frequency of price changes contributes to the decrease in the inflation, while the size of price changes remains almost unchanged. This result indicates that the price-setting behavior in those categories is consistent with the state-dependent pricing model. Looking at the frequency distribution of the size of price changes, items which have a lower bound in the size of price changes, most of which are found in services category, tend to respond to a change in the inflation by adjusting the frequency of price changes. This fact also supports the state-dependent pricing behavior for services. In contrast, for the flexible-type items such as fresh food and the Taylor-type items including most of categories for public services and some categories for general services, both the frequency

of price changes and the size of price changes respond to the fall in the inflation rate. This indicates that the price-setting behavior in such categories is consistent with both time-dependent pricing and state-dependent pricing models.

Fourth, we consider two possible factors contribute to the heterogeneity of the price-setting behavior revealed by the frequency of price changes and the shape of hazard functions. One possible factor is the share of labor costs in the production costs. We find a negative correlation between the frequency of price changes and the share of labor costs in the production costs, whereby the frequency declines as the share rises. We also find a negative correlation between the changes in the frequency and the changes in the share of labor costs during the 1990s. We consider that for services items, whose prices are highly affected by a share of labor costs, a moderate change in wages significantly decreased the frequency of price changes. Other possible factors are changes in the market structure such as price regulations and firms' price strategies regarding sales. We find that the change in price regulations and that in firms' price strategies regarding temporary sales greatly led to the increase in the frequency for goods. Given the facts above, it is possible that if we could exclude the temporary sales from the analysis, the frequency of price changes might not rise. We, therefore, conjecture that the fall in the price stickiness for goods does not correspond to a response to the business cycle.

Finally we address the remaining three issues for future research. The first issue is why the hazard functions for individual items are downward sloping. In this paper, we point out the heterogeneity in the type of outlets as the most promising factor. If the individual price data at the outlet level becomes available, we can verify it. The second issue is whether the positive correlation between the change in the frequency of price changes and that in the inflation rate is robust or not. In this paper, we do find the correlation during the period when the CPI inflation rate fluctuated from minus one to positive three percent per year. This could be confirmed if the micro data during the high inflation period such as the 1970s become available. The third issue is what implication the increase in the frequency of price changes for goods has. In this paper, the temporary sales within seven days are excluded but not the relatively long-term sales. Whether the frequency of price changes for goods has increased even excluding sales is a remaining question. We also need to further examine whether the increase in the frequency including sales corresponds to the price dynamics which has an impact on macro economy.

Appendix 1. Estimation Method for Hazard

This appendix explains the estimation method for the hazard function of price changes.

Estimation method for Hazard Rates

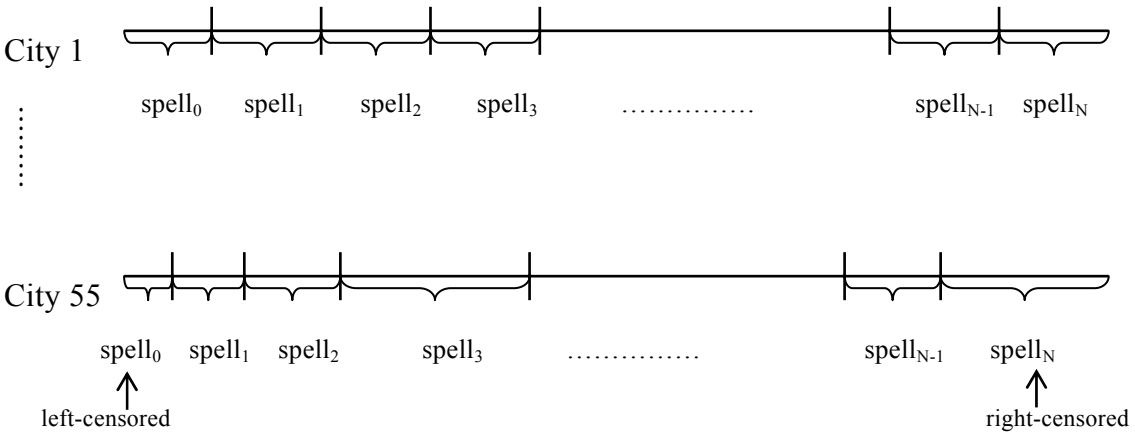
In this paper, hazard rate is defined as "the conditional probability that the price changes after t periods given that it remained unchanged until period t." We estimate a non-parametric hazard rate based on the Kaplan-Meier estimator, which is commonly used in the analysis of EU countries. The estimator λ is defined as below.

$$\lambda(t) = \frac{h_t}{r_t},$$

where h_t denotes the number of spells whose prices are changed at time t and r_t denotes the risk set, respectively. The risk set is the number of spells which have not yet changed just prior to that time.

How to count spells

We use 55 city average price data for each item. Spells are defined as a series of data with no price change.



The sequence of spells is called a trajectory. For the estimation of hazard function, we count the number of spells by duration within a trajectory. The first spell of the sample is a left-censored spell and the last spell is a right-censored spell. The true durations of censored spells are unknown since we cannot observe the last price change of left-censored

spells and the next price change of the right-censored spells. The left-censored spells are usually excluded from and the right-censored spells are included in the trajectory. The inclusion of right-censored spells is essential for estimating the survival probabilities of the final spells. Following the usual treatment, we exclude left-censored spells ($spell_0$) from and include right-censored spells ($spell_N$) in the trajectory. We also treat those whose price record was interrupted or completed during sample period as right-censored spells.

How to estimate the hazard rate of individual item

When we estimate hazard function with a large sample, we choose one spell randomly from the sample. If we use all spells instead of one spell randomly chosen in a trajectory, items with high probability of price changes provide a large number of spells with a short duration. As a result, the hazard rate at short durations has an upward bias.

The number of our sample, however, is not sufficient for estimating hazard functions of individual item using random sampling procedure. We decide to account for the deficiency of the data by allowing multiple extractions of spells.

To avoid estimating a biased hazard rate, we put the weight on each spell. The weight is an inverse of the total number of spells for each city; therefore sum of the weights within a city is unity. Each spell is multiplied by this weight and then summed up across cities.

For example, the procedure of counting spells of a watch is as follows. Suppose the total number of spells of the watch is 20 in city A and 10 in city B, and the number of spells by duration is as below.

City A: 10 spells with durations of 2 month, and 10 spells with durations of 4 month,

City B: 2 spell with duration of 2 month, 4 spells with durations of 4 month, and
4 spells with durations of 10 month.

Then, we calculate weighted number of spells of item j with duration k (Sj,k) as follows.

$$S_{watch,2} = 10/20 + 2/10$$

$$S_{watch,4} = 10/20 + 4/10$$

$$S_{watch,10} = 4/10$$

We use $S_{watch,2,}$ $S_{watch,4.}$ $S_{watch,10}$ to estimate hazard function of the watch.

Appendix 2-1. Item Selection for International Comparison

In this appendix, we introduce the criteria for selecting common items used in Dhyne et al. [2006], in which US-EU comparison is conducted.

Criteria for selecting the common sample of 50 product categories

First, the sample has to be representative of the different 2-digit COICOP (Classification of Individual Consumption by Purpose) categories designated by United Nation 93SNA. Second, for each COICOP category level, the sample has to be representative of the 5 main components of the CPI: Unprocessed food, Processed food, Energy, Non energy industrial goods, Services. Using the COICOP category weights in the euro area HICP (Harmonized Index of Consumer Prices), 50 product categories were randomly chosen within each stratum from the list of 7-digit COICOP product categories included in the CPI.

Items excluded

"Health Care Services" (COICOP 06) and "Education" (COICOP 10) are excluded from the sample since some countries has no access to individual price reports for those two categories. Some goods or services (for instance housing rent, cars, electricity, gas, water and telecommunication services) are not used either for similar reasons.

Corresponding items in Japan

Based on the criteria above, we select 46 items which correspond to the common sample of 50 product categories.

Appendix 2-2. Structure and Composition of the Common Sample (50 Items)

COICOP	CPI	Selected Product Categories	Corresponding Items (Japan)
01 Food and non alcoholic beverages	Unprocessed food	steak	Beef (loin)
		fresh fish	Tuna fish
		lettuce	Lettuce
		banana	Bananas
	Processed food	milk	Fresh milk (sold in stores)
		sugar	Sugar
		frozen spinach	Frozen croquettes
		mineral water	Mineral water
		coffee	Instant coffee
02 Alcoholic beverages, tabacco and narcotics	Processed food	whisky	Whisky(43% vol. and over)
		beer in a shop	Beer
03 Clothing and footwear	Non energy industrial goods	socks	Women's socks
		jeans	Men's slacks (jeans)
		sport shoes	Canvas shoes (for adults)
		shirt	Men's business shirts (long sleeves)
	Services	dry cleaning (suit)	Dry cleaning charges (men's suits)
04 Housing, water, electricity, gas and other fuels	Energy	gasoline (heating purpose)	Kerosene
	Non energy industrial goods	acrylic painting	Paint
		cement	
	Services	hourly rate of an electrician	TV set repair charges
		hourly rate of a plumber	Plumbing
05 Furnishing, household eqipment and routine	Non energy industrial goods	toaster	Microwave ovens
		electric bulb	Fluorescent lamps
		1 type of furniture	Chests of drawers
		towel	Towels
	Services	domestic serices	Domestic help
07 Transport	Energy	fuel (type1)	Gasoline (regular)
		fuel (type2)	Gasoline (premium)
	Non energy industrial goods	car tyre	Tires
	Services	hourly rate in a garage	Charges for parking
		car wash	
		balancing of wheels	Regular inspection
		taxi	Taxi fares
08 Communications	Services	fax machine	
09 Recreation and culture	Non energy industrial goods	television set	TV sets
		dog food	Pet foods (dog foods)
		tennis ball	Soccer balls
		construction game (Lego)	Building blocks
	Services	movie	Admission, movies
		videotape rental	Charges for video rental
		photo development	Photo processing charges
11 Restaurants and hotels	Services	hotel room	
		glass of beer in a bar	Beer (eating out)
		1 meal in a restaurant	Curry & rice
		hot-dog	Sandwiches
		cola based lemonade in a bar	Coffee (eating out)
12 Miscellaneous goods and services	Non energy industrial goods	toothpaste	Toothpaste
		suitcase	Suitcases
	Services	haircut (men)	Men's haircut charges
		haircut (ladies)	Women's haircut charges

Note: Shaded cells indicate no relevant item is available.

Appendix 3. Criterion for judging whether the distribution has a dip

In this paper, we consider that a distribution of the size of price changes has a dip (extremely low frequency) nearest to zero percent if the criterion below is fulfilled.

Criterion

If an item has an actual distribution of the size of price changes whose frequency nearest to zero is smaller than that of a standard normal distribution, we label it as an item which has a dip nearest to zero percent.

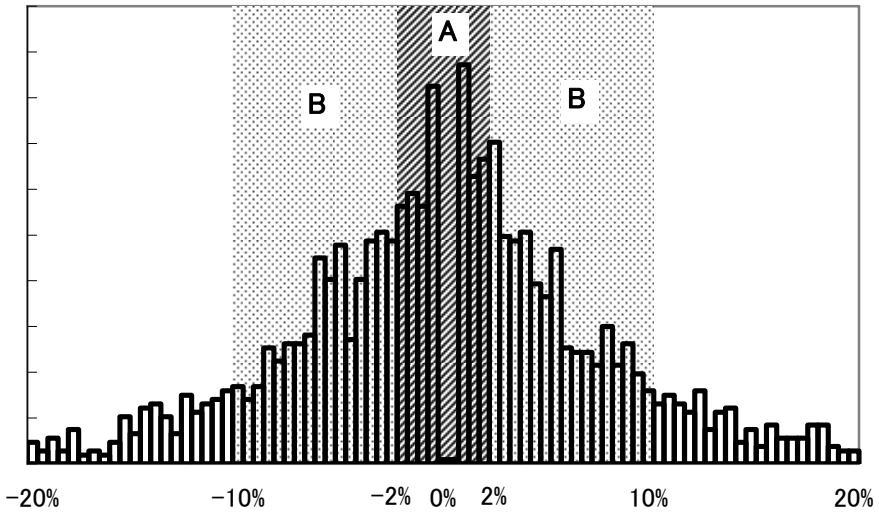
1. Definition of the frequency nearest to zero for the actual distribution (The figure below)

For the actual distribution, $\dfrac{\text{Frequency between -2\%〜+2\% <Area A in the figure below>}}{\text{Frequency between -10\%〜+10\% <Area B in the figure below>}}$

2. Definition of the frequency nearest to zero for the standard normal distribution

For the standard normal distribution, $\dfrac{\text{Frequency between } \frac{(-2\%+\mu)〜(+2\%+\mu)}{\sigma}}{\text{Frequency between } \frac{(-10\%+\mu)〜(+10\%+\mu)}{\sigma}}$

,where μ and σ denote the average size and standard deviation of price changes, respectively.



Size of price changes

Appendix 4. Calculation Method of Share of Labor Costs

In this appendix, we explain a calculation method of share of labor costs using "2000 Input-Output Table," conducted by Ministry of Internal Affairs and Communications.

Items for Input-Output Table and CPI

We match sectors within 2000 Input-Output Table to our data set (CPI items, CY2000 base) according to the specification of CPI. We exclude the automobile insurance premium and various types of fees because the definition of domestic production in Input-Output Table doesn't correspond to that of weights in CPI. In addition, we consider a share of labor costs is 100% for items whose surveyed prices are identical to labor costs, i.e. cost per man-month, (service charges for plastering, gardening, carpentering, domestic help etc.).

Labor Cost

Labor cost is defined as a sum of "Wages and salaries", "Contribution of employers to social insurance", "Other payments and allowances", "Operating surplus" from 2000 Input-Output Table. The rationale for including operating surplus is that mixed income incorporated in operating surplus is reasonably considered as labor cost for sole proprietors.

An example for an industry mainly consisting of sole proprietors, whose share of labor costs is high:

Men's haircut charges

Share of Labor Costs (excluding operating surplus): 30%

Share of Labor Costs (including operating surplus): 69%

In this case, since the haircut industry holds many sole proprietors, labor cost would be undervalued if mixed income (operating surplus), which is a proprietors' own income, is not included. As similar cases are often seen particularly in the service category, we decided to treat operating surplus as a part of labor cost.

Note that this treatment over-evaluates the labor costs for such industries that consist of mostly business corporation.

Share of Labor Cost

For calculating the share of labor costs in the production costs, we need a figure of domestic production measured in purchasers' prices in accordance with the concept underlying CPI. Thus, using the equation below, we convert the share of labor costs calculated from "domestic production measured in producers' prices" into that calculated from "domestic production measured in purchasers' prices."

$$\text{Labor cost ratio}(\%) = \frac{\text{Labor cost}}{\text{Domestic production} \times \dfrac{\text{Consumption expenditure of households (purchasers' prices)}}{\text{Consumption expenditure of households (producers' prices)}}} \times 100$$

,where "Consumption expenditure of households (purchasers' prices)" is a sum of "Consumption expenditure of households (producers' prices)", "Trade margins (wholesale)" and "Transportation fees." The denominator indicates consumption expenditure of households measured in purchasers' prices, which is defined as a product of "Domestic production" and "Consumption expenditure of households (purchasers' prices)" / "Consumption expenditure of households (producers' prices)."

Appendix 5. Impulse Responses to Price Shocks

We examine whether the price changes resulted in permanent shifts in price levels or temporary fluctuations by estimating a panel autoregressive model for each item (equation(1)).

$$\Delta P_t = \alpha + \beta_1 \Delta P_{t-1} + \beta_2 \Delta P_{t-2} + \cdots + \beta_{12} \Delta P_{t-12} + u_t , \qquad (1)$$

where P_t and α denote a price at time t and an intercept, respectively. Δ denotes a first difference. We estimate the equation using Pooled OLS[20].

Using estimated coefficients, we can rewrite the equation (1) into the level equation as below.

$$P_t = \hat{\alpha} + (1 + \hat{\beta}_1) P_{t-1} + (-\hat{\beta}_2 + \hat{\beta}_3) P_{t-2} + \cdots - \hat{\beta}_{12} P_{t-13} . \qquad (2)$$

This is an impulse response of prices to one unit shock in its price level at time 0. Figures in the next page as well as Chart 27, 28 plot this impulse response for each item and category.

How to deal with specification revisions

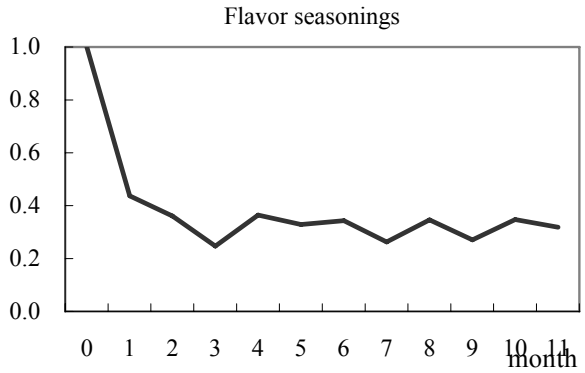
For the data used in this estimation, we regard price changes resulted from specification revisions by "direct comparison method" as actual price changes while we regard price changes due to specification revisions by "overlap method" as no change in prices. For the latter case, therefore, we convert the data as follows so that no price change occurs when the specification is revised.

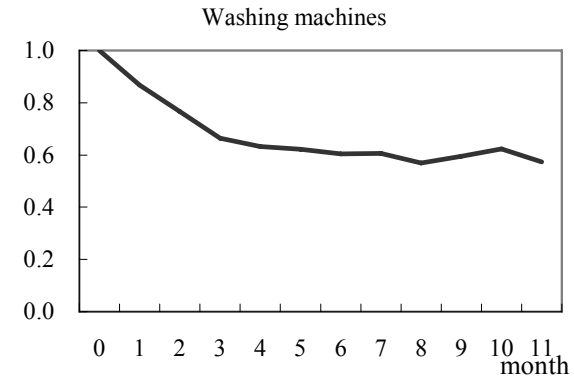
Prices after time t, when specification revised ($i \geq 0$)

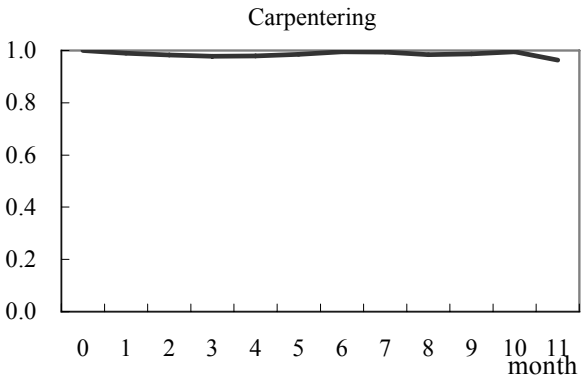
$$\text{Adjusted price at time t+i} = \text{Actual price at time t+i} \times \frac{\text{Actual price at time t-1}}{\text{Actual price at time t}}$$

[20] We also obtain impulse responses from Within Group estimation as a robustness check. Although there are slight differences in the levels of the remaining shocks, time series characteristics does not alter --- in the 1990s, the remaining shocks for items in goods category have fallen, while those for items in service category have remained quite large.

Examples of Individual Impulse Responses (CY 1999～2003)







Reference

(In English)

- Álvarez, Luis J., Pablo Burriel, and Ignacio Hernando [2005], "Do decreasing hazard functions for price changes make any sense?," *European Central Bank Working Paper Series* 461, March 2005.
- Aucremanne, Luc, and Emmanuel Dhyne [2005], "Time-dependent versus state-dependent pricing: A panel data approach to the determinants of Belgian consumer price changes," *European Central Bank Working Paper Series* 462, March 2005.
- Bank of Japan, Research and Statistics Department [2000], "Price-setting behavior of Japanese companies –The results of "Survey of price-setting behavior of Japanese companies" and its analysis–," Bank of Japan Research Papers.
- Baudry, Laurent, Hervé Le Bihan, Patrick Sevestre and Sylvie Tarrieu [2004], "Price rigidity: Evidence from the French CPI micro-data," *European Central Bank Working Paper Series* 384, August 2004.
- Baumgartner, Josef, Ernst Glatzer, Fabio Rumler, and Alfred Stiglbauer [2005], "How frequently do consumer prices change in Austria? Evidence from micro CPI data," *European Central Bank Working Paper Series* 523, September 2005.
- Bils, Mark, and Peter J. Klenow [2004], "Some Evidence on the Importance of Sticky Prices," *Journal of Political Economy*, 112-5, 2004.
- Blinder, S. Alan, Elie R. D. Canetti, David E. Lebow, and Jeremy B. Rudd [1998], *Asking about prices: A new approach to understanding price stickiness*, Russel Sage Foundation, 1998.
- Calvo, Guillermo A. [1983], "Staggered prices in a utility-maximizing framework," *Journal of Monetary Economics*, 12:383-398, 1983.
- Caplin Andrew S., and Daniel F.Spulber [1987], "Menu costs and the Neutrality of Money," *Quarterly Journal of Economics*, 102:703-725.
- Dhyne, Emmanuel, Luis J. Álvarez, Hervé Le Bihan, Giovanni Veronese, Daniel Dias, Johannes Hoffman, Nicole Jonker, Patrick Lünnemann, Fabio Rumler, and Jouko Vilmunen [2006], "Price changes in the Euro area and the United States: Some facts from individual consumer price data," *Journal of Economic Perspectives*

vol.20, Number 2, pp.171-192.

- Dotsey, M., Robert G. King, and Alexander L. Wolman [1999], "State-Dependent Pricing and the General Equilibrium Dynamics of Money and Output," *Quarterly Journal of Economics*, 114:655-690.
- Enomoto, Hidetaka [2007], "Multi-sector menu cost model, decreasing hazard, and Phillips curve," *Bank of Japan Working Paper Series* 07-E-3.
- Golosov, Mikhail, and Robert E. Lucas, Jr. [2007], "Menu costs and Phillips curves," *Journal of Political Economy* vol.115, Number 2.
- Ikeda, Daisuke and Shinichi Nishioka [2007], "Price Setting Behavior and Hazard functions: Evidence from Japanese CPI micro data," *Bank of Japan Working Paper Series* 07-E-19.
- Klenow, Peter. J, and Oleksiy Kryvtsov [2005], "State-dependent or time-dependent pricing: Does it matter for recent U.S. inflation?," *NBER Working Paper Series* 11043.
- Kuroda, Sachiko and Isamu Yamamoto [2005], "Wage Fluctuations in Japan after the Bursting of the Bubble Economy: Downward Nominal Wage Rigidity, Payroll, and the Unemployment Rate," *Bank of Japan Monetary and Economic Studies* Vol.23, No.2.
- Nakamura, Emi, and Jón Steinsson [2007], "Five facts about prices: A reevaluation of menu cost models," mimeo.
- Taylor, John B. [1979], "Staggered wage setting in a macro model," *American Economic Review*, 69:108-113.
- Veronese, Giovanni, Silvia Fabiani, Angela Gattulli, and Roberto Sabbatini [2005], "Consumer price behaviour in Italy: Evidence from micro CPI data," *European Central Bank Working Paper Series* 449.

(In Japanese)

- Sakura, Kenichi, Hitoshi Sasaki, Masahiro Higo [2005], "Economic development in Japan since the 1990s – fact finding-," Bank of Japan Working Paper Series 05-J-10.

Chart 1. Items by Category

(1) Items by Category (CY2000 base)

		number of items		Examples
		CPI	our dataset	
Total		598	493	—
Goods		456	372	—
Agricultural & aquatic products	Fresh food	61	45	Tuna fish, Lettuce, Bananas
	Food, excluding fresh food	11	11	Beef, Pork, Hen eggs, Cut flowers
	Other agricultural & aquatic products	6	6	Rice, Designated standard rice, Red beans
Industrial products	Food products	126	126	Butter, Cakes, Beer
	Textiles	73	29	Quilts, Women's dresses, Neckties
	Petroleum products	4	4	Liquefied propane, Kerosene, Gasoline
	Other industrial products	159	140	Refrigerators, Wardrobes, Facial tissue, Medicines for cold, Rings, Cigarettes
Electricity, Gas & Water charges		3	3	Electricity, Gas, Water charges
Publications		13	8	School textbooks, Newspapers, Books, Weekly magazines
Services		142	121	—
Public services	House rent, public & public corporation	2	0	—
	Services related to domestic duties	12	11	Sewerage charges, Automotive insurance premium, Charges for certificates of registered stamps
	Services related to medical care & welfare	3	2	Nursery school fees, Day service fees of nursing care for the aged
	Services related to transportation & communication	22	18	Railway fares(ordinary fares, excluding"Shinkansen"), Bus fares, Postcards
	Services related to education	3	3	College & university fees(national), Kindergarten fees(public)
	Services related to reading & recreation	6	6	Fees for TV viewers, Admission fees to the art museum
General services	Eating out	21	21	Japanese noodles, Hamburgers, School lunch
	Private house rent	4	0	—
	Imputed rent	4	0	—
	Services related to domestic duties	28	28	Carpentering, Automotive maintenance charges, Men's haircut charges, Charges for transfer commission
	Services related to medical care & welfare	4	4	Delivery fees in hospital, Charges for massage
	Services related to education	8	8	PTA menbership fees, College & university fees(private), Tutorial fees
	Services related to reading & recreation	25	20	Lesson fees, Admission(movies), Admission fees to the recreation ground, Veterinary surgeon fees

(2) Items Excluded from the analysis (CY2000 base)

reasons for exclusion	number of items	items
a)	19	Fire insurance premium, Medical treatment, Railway fares(ordinary fares, for"Shinkansen"), Airplane fares, Automobiles less than 660cc, Automobiles A/B, Automobiles less than 2000cc(imported), Automobiles more than 2000cc, Automobiles more than 2000cc(imported), Telephone charges, Mobile telephone charges, Package tours to overseas, Imputed rent houses, Personal computers(desktop/notes)
b)	67	Bonito, Oysters, Green soybeans, Apples A/B, Mandarin oranges, Iyo-mandarins, Pears, Grapes A/B, Persimmons, Peaches, Watermelons, Melons, Strawberries, Cherries, Fan heaters, "Kotatsu", Japanese electric heaters, Electric carpets, Blankets, Men's suits, Men's jackets, Men's slacks, Men's coats, Boys'school uniforms, Women's suits, One-piece dresses, Skirts, Women's slacks, Women's coats Women's jackets, Girls'school uniforms, Girls'skirts, Men's business shirts, Sport shirts, Men's sweaters, Blouses, Women's T-shirts, Women's sweaters, Children's T-shirts, Children's sweaters, Men's undershirts, Men's underpants, Men's pajamas, Mufflers, Men's socks, Children's tights, Desks, School knapsacks, Admission(soccer, progessional baseball games)
c)	7	House rent(private, public, public corporation), Hotel charges
d)	12	Personal computers printer, Word processors, Face cream-A, Milky lotion-A, Foundation-A, Lipsticks-A, Monthly magazines(boys', hobbies & cultures, living informations, personal computers, women's), Internet connection fee

Note: For the reasons for exclusion, see p.4 of this paper.

Chart 2. Data Coverage

	Number of Items		Coverage
	CPI	our dataset	(%)
CY1990 Base	561	476	84.8
CY1995 Base	580	493	85.0
CY2000 Base	598	493	82.4

(%)

	Coverage			Weight	
	1990	1995	2000	CPI	our dataset
Total	73.2	70.5	68.0	100.0	100.0
Total, excluding imputed rent	81.3	81.4	78.6	86.4	100.0
Total, excluding fresh food	73.0	70.2	67.5	95.5	94.9
Total, excluding imputed rent & fresh food	81.6	81.7	78.7	81.9	94.9
Goods	84.7	86.1	84.7	50.8	63.3
Agricultural & aquatic products	87.1	87.1	86.6	7.8	9.9
Fresh agricultural & aquatic products	84.5	84.8	84.5	6.7	8.3
Fresh food	76.9	77.5	76.8	4.5	5.1
Food,excluding fresh food	100.0	100.0	100.0	2.2	3.3
Other agricultural & aquatic products	100.0	100.0	100.0	1.0	1.5
Industrial products	81.8	83.5	82.1	36.5	44.1
Food products	100.0	100.0	100.0	13.7	20.2
Textiles	39.1	39.2	40.7	5.6	3.4
Petroleum products	100.0	100.0	100.0	3.0	4.4
Other industrial products	85.1	85.0	77.3	14.1	16.1
Electricity, gas & water charges	100.0	100.0	100.0	4.8	7.1
Publications	100.0	100.0	90.7	1.7	2.3
Services	58.8	53.9	50.6	49.2	36.7
Services, excluding imputed rent	75.7	74.6	70.0	35.6	36.7
Public services	58.7	60.5	56.4	12.9	10.7
House rent, public & public corporation	0.0	0.0	0.0	0.5	0.0
Services related to domestic duties	76.0	82.0	84.6	3.0	3.7
Services related to medical care & welfare	—	—	19.8	2.0	0.6
Services related to transportation & communication	62.2	61.3	45.7	5.6	3.8
Services related to education	100.0	100.0	100.0	0.6	0.9
Services related to reading & recreation	100.0	100.0	100.0	1.2	1.7
General services	58.8	52.0	48.6	36.3	25.9
General services, excluding imputed rent	83.6	81.0	77.7	22.7	25.9
Eating out	100.0	100.0	100.0	6.2	9.1
Private house rent	0.0	0.0	0.0	3.0	0.0
Imputed rent	0.0	0.0	0.0	13.6	0.0
Other services	88.9	90.1	84.7	13.5	16.8
Services related to domestic duties	100.0	100.0	100.0	4.8	7.1
Services related to medical care & welfare	100.0	100.0	100.0	0.3	0.5
Services related to education	100.0	100.0	100.0	3.3	4.8
Services related to reading & recreation	71.9	72.6	59.4	5.1	4.4

Chart 3. Number of Samples Prices by City and Category

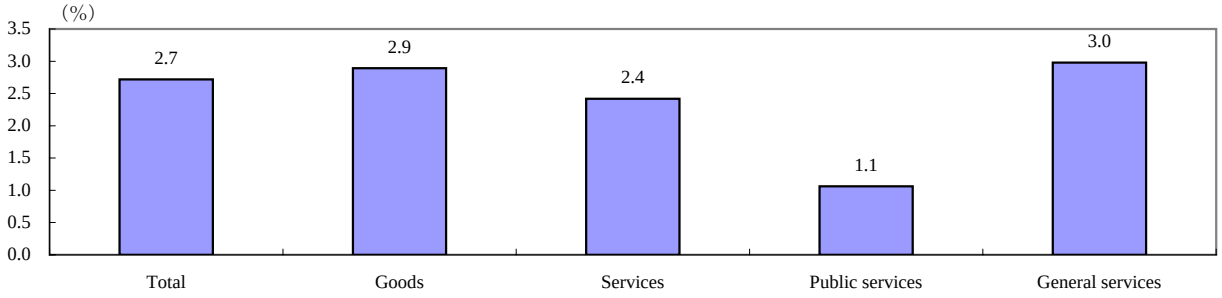
(1) Number of Samples Collected by City

	Number of Cities	GroupA	GroupB	GroupC	GroupD
Cities with prefectural government other than 16 major large cities	33	4	3	2	1
Cities with population 150,000 or more (excl. cities with prefectural government)	22	4	3	1	1

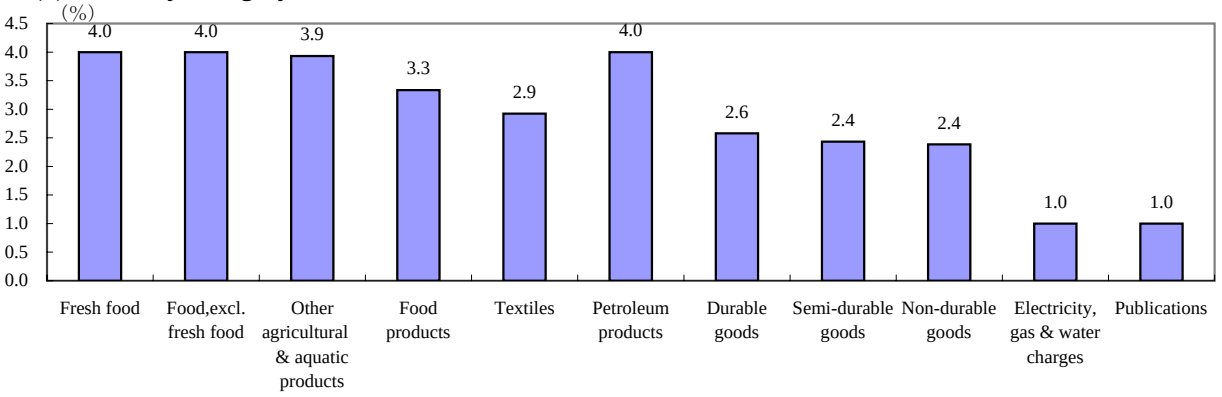
Note: 16 major large cities include Tokyo, Osaka, Yokohama, Kyoto, Kobe, Sapporo, Sendai, Chiba, Kawasaki, Hiroshima, Fukuoka, Kitakyushu, Kanazawa, Takamatsu, Naha.

(2) Average Number of Samples by Category

(a) Total, Goods, and Services



(b) Goods by Category



(c) Services by Category

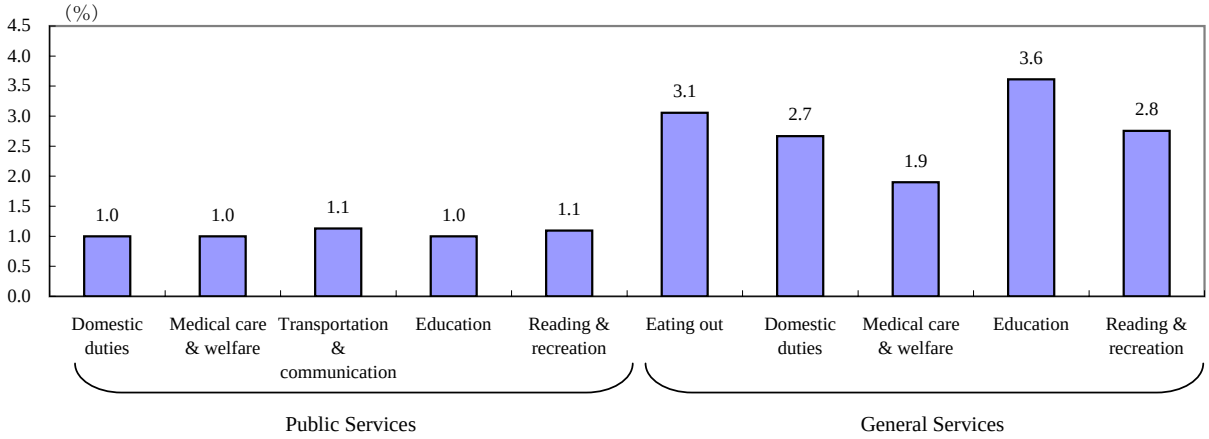
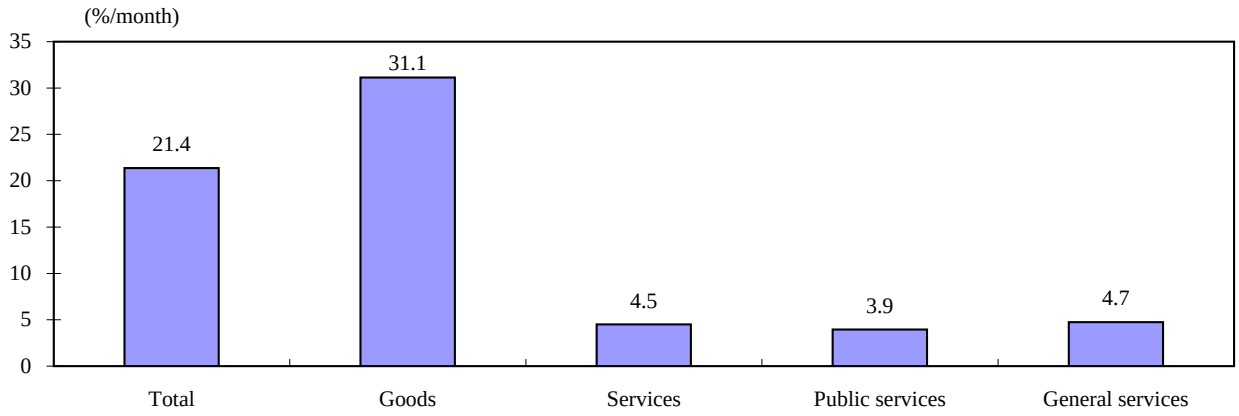
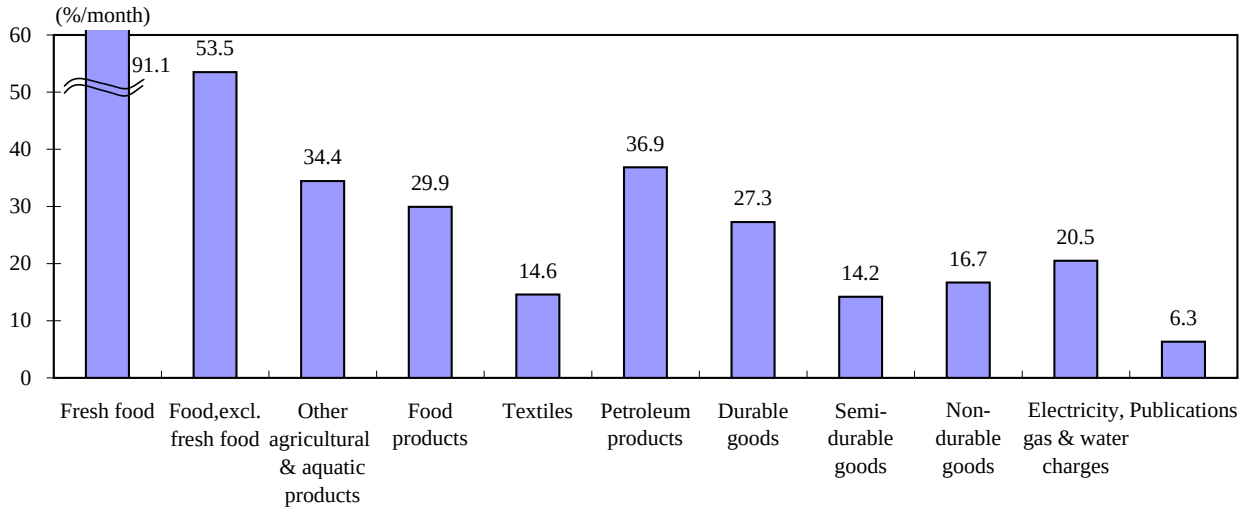


Chart 4. Average Frequency of Price Changes (CY 1999 to CY 2003)

(1) Total, Goods, and Services



(2) Goods by Category



(3) Services by Category

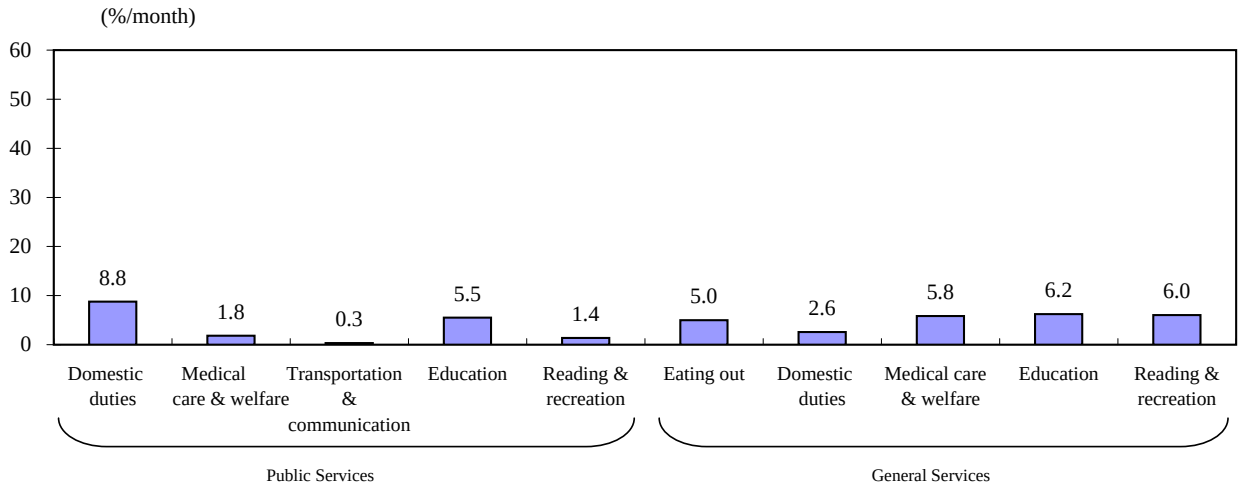
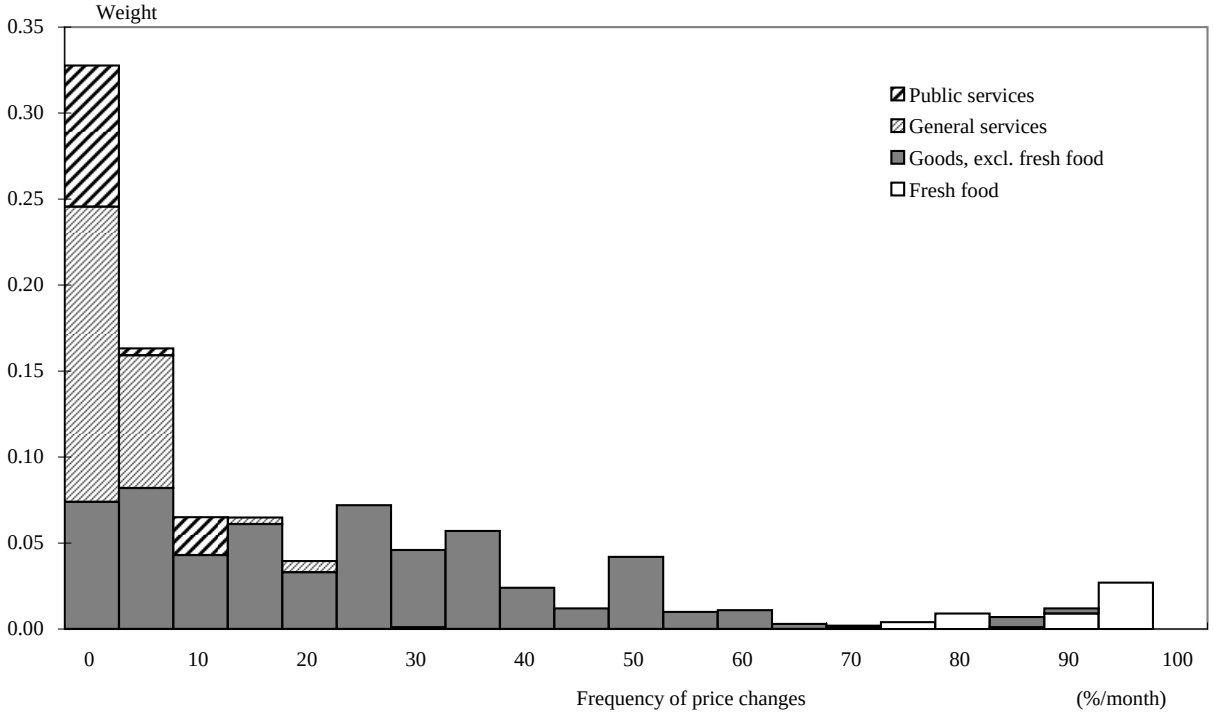


Chart 5. Distribution in the Average Frequency of Price Changes (CY1999 to 2003)

(1) Distribution of the Average Frequency of Price Changes



(2) International Comparison of the Average Frequency of Price Changes (50 item base)

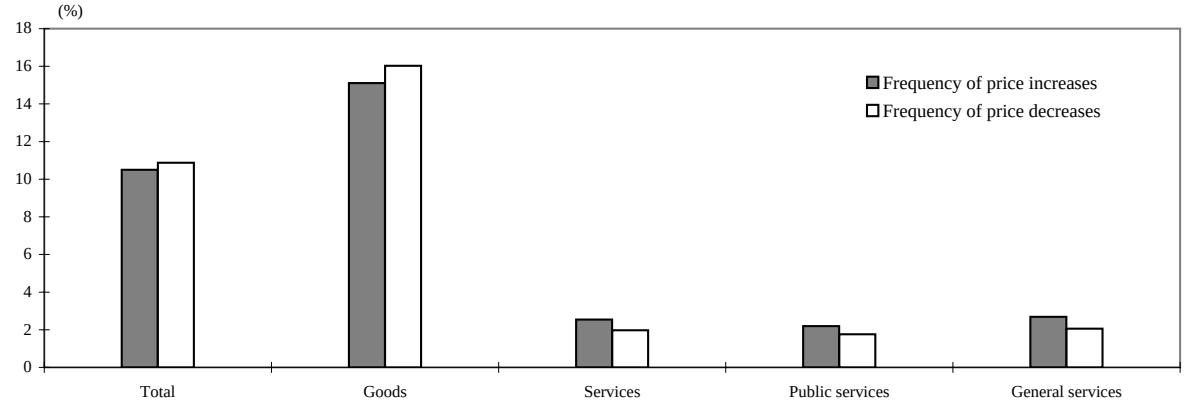
(%/month)

Country	Unprocessed food	Processed food	Energy	Non energy industrial product	Services	Total
Japan	**69.0**	**26.9**	**48.6**	**20.7**	**3.1**	**22.9**
US	47.7	27.1	74.1	22.4	15.0	24.8
EU	36.6	15.9	68.3	10.3	6.4	16.8

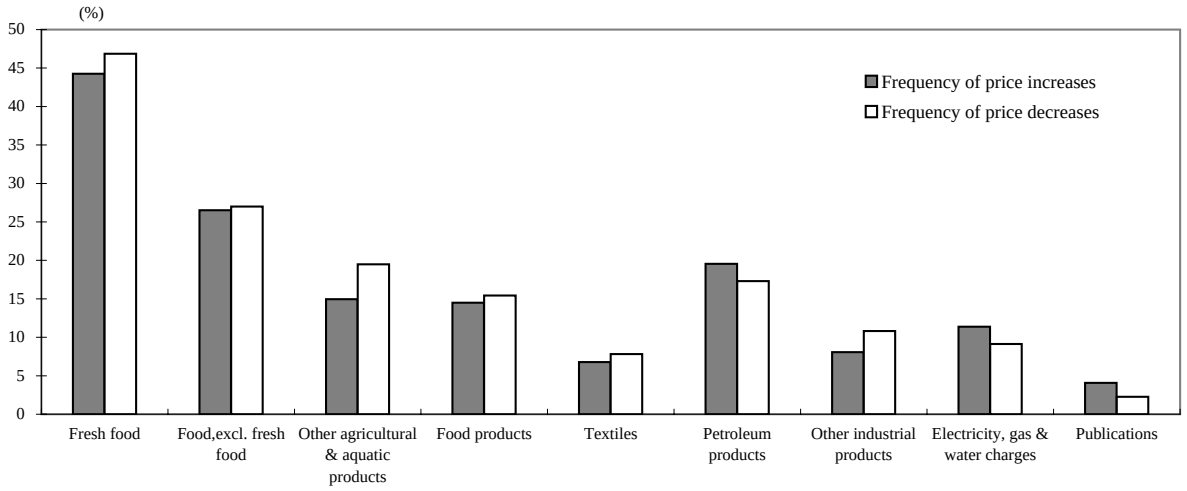
Note: Figures are calculated using country-specific weights for each item.
Source: Dhyne *et al.* [2006] (except for Japan)

Chart 6. Average Frequency of Price Increases and Decreases (CY1999 to 2003)

(1) Total, Goods, and Services



(2) Goods, by Category



(3) Services, by Category

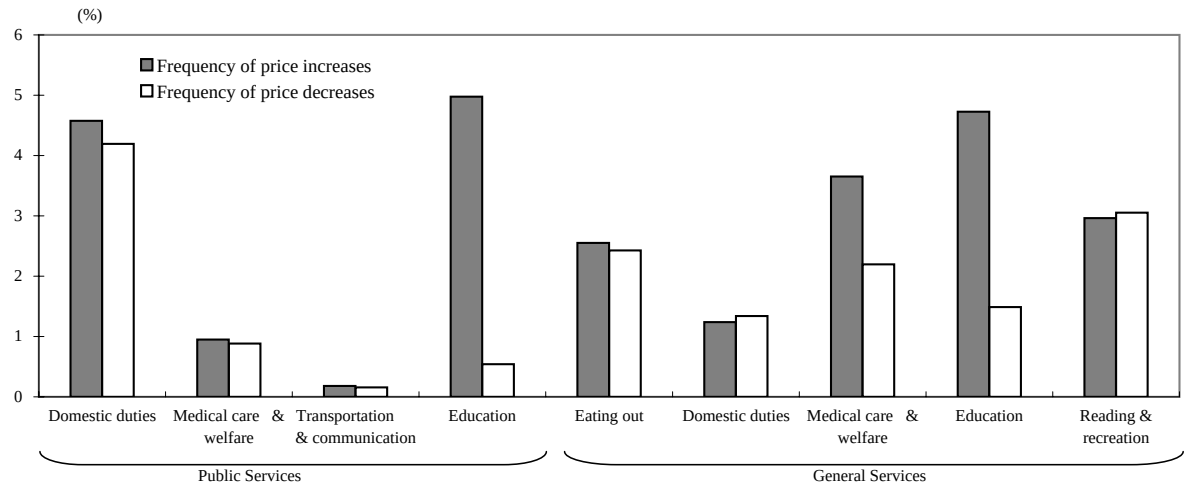
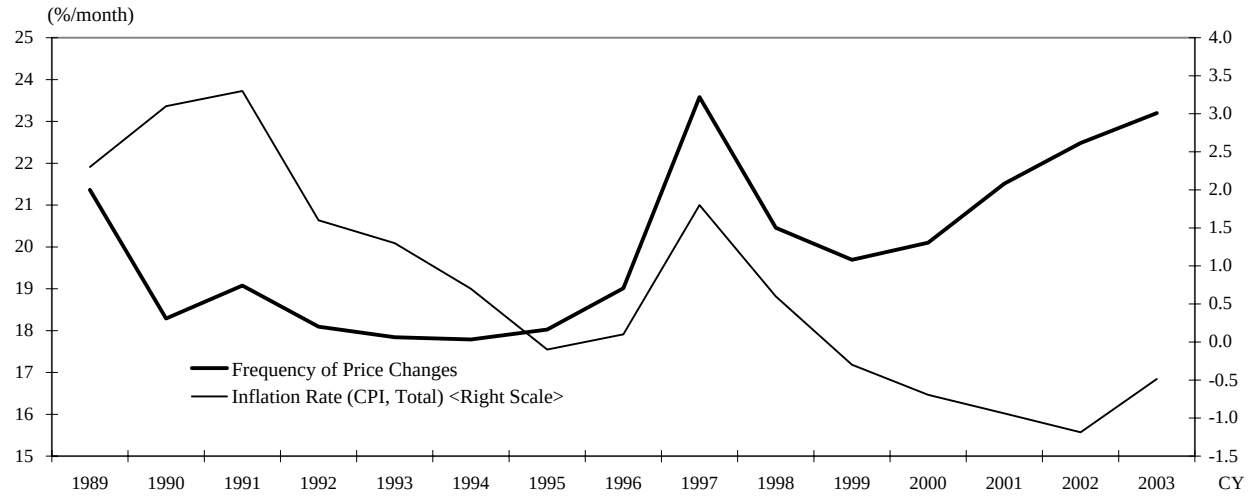
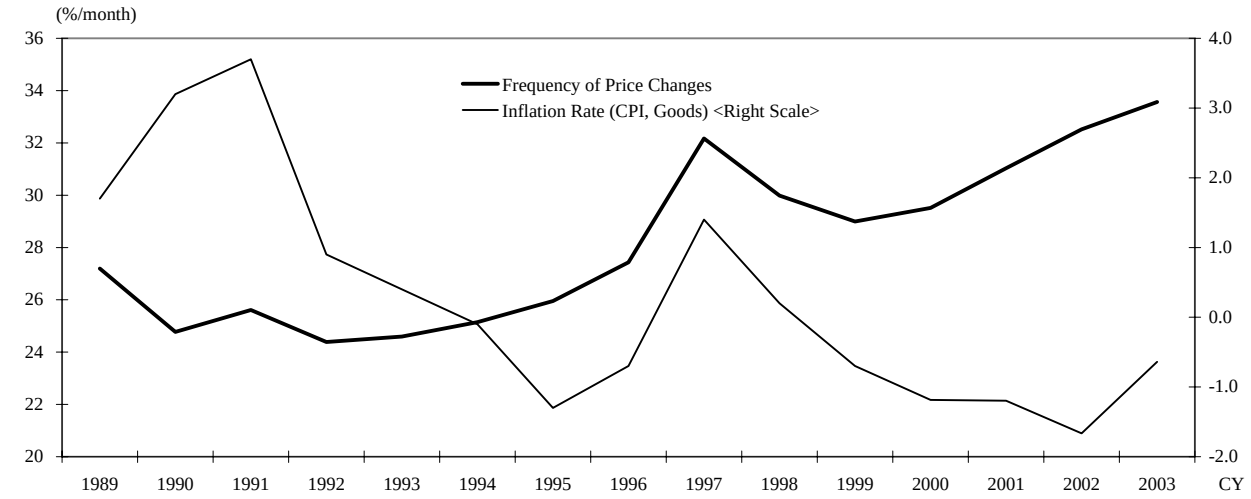


Chart 7. Frequency of Price Changes by Year(CY1989-2003)

(1) Total



(2) Goods



(3) Services

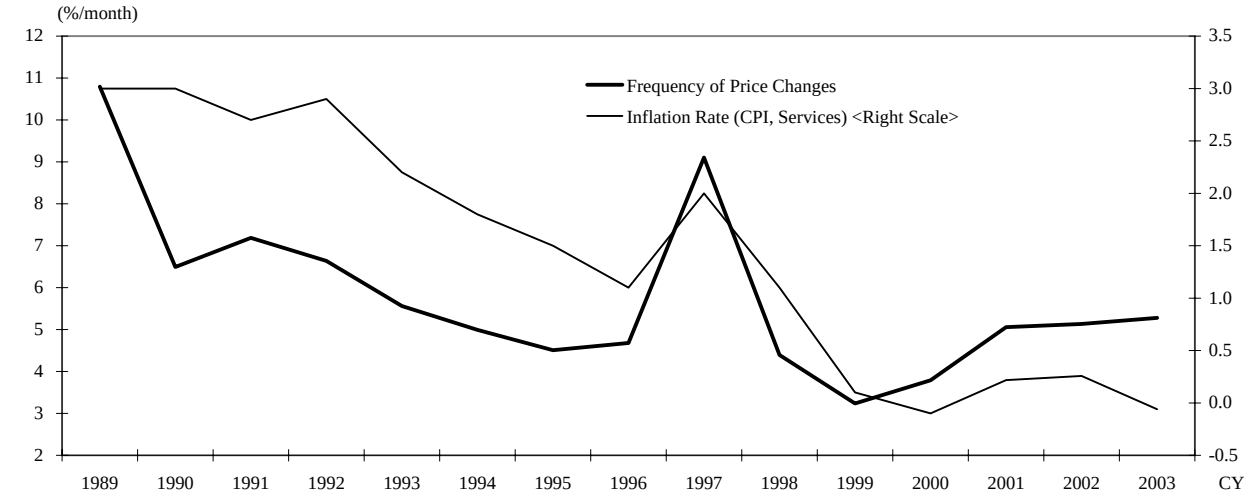
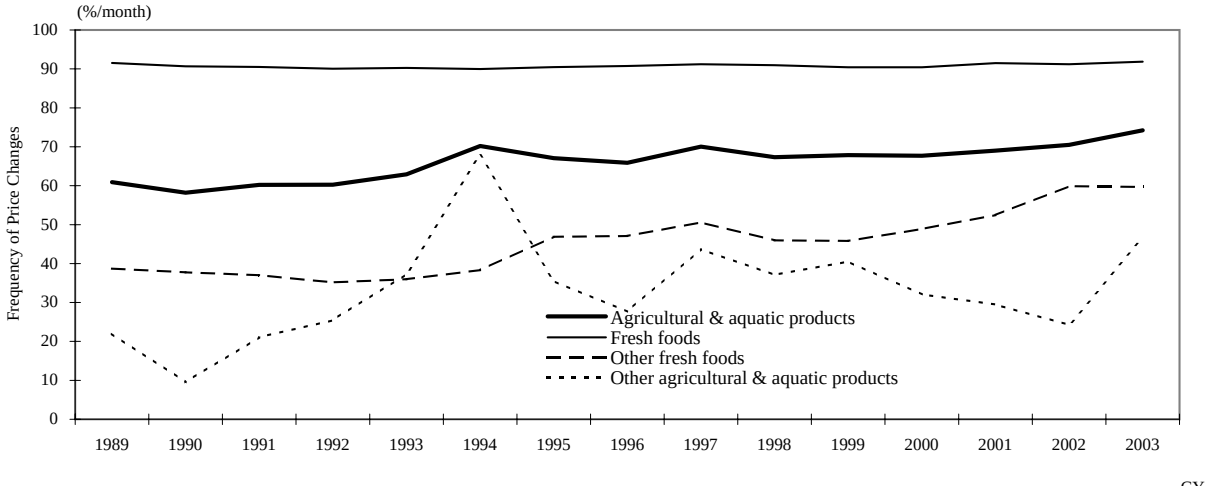
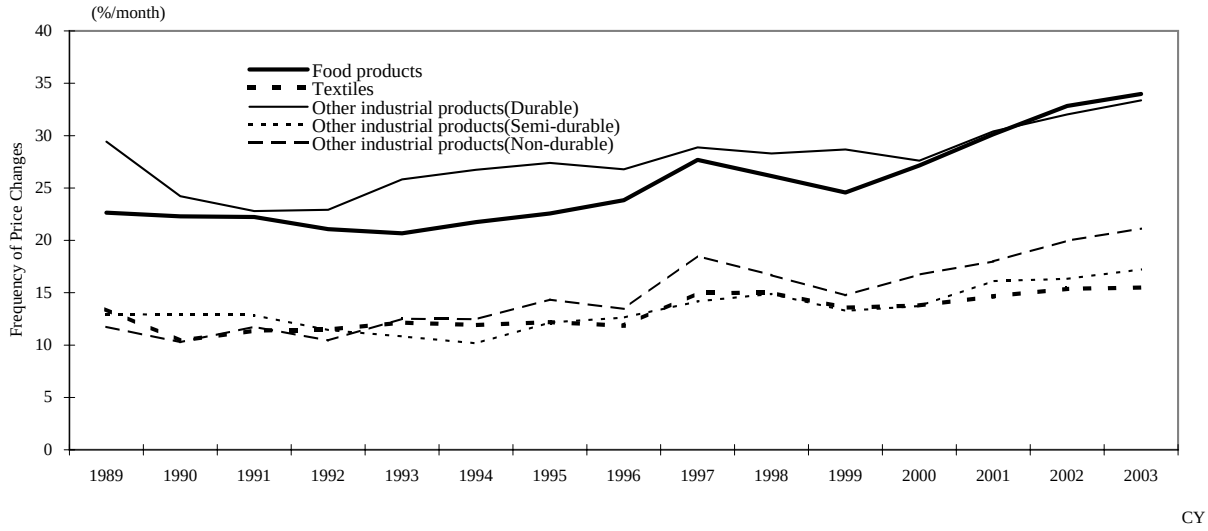


Chart 8. Frequency of Price Changes by Year (CY1989 to 2003): Goods

(1) Agricultural & aquatic products, Fresh foods, Other fresh foods, Other agricultural & aquatic products



(2) Food products, Textiles, Petroleum products,
& Other industrial products (durable goods, semi-durable goods, & non-durable goods)



(3) Petroleum products, Electricity,city gas & water charges, & Publications

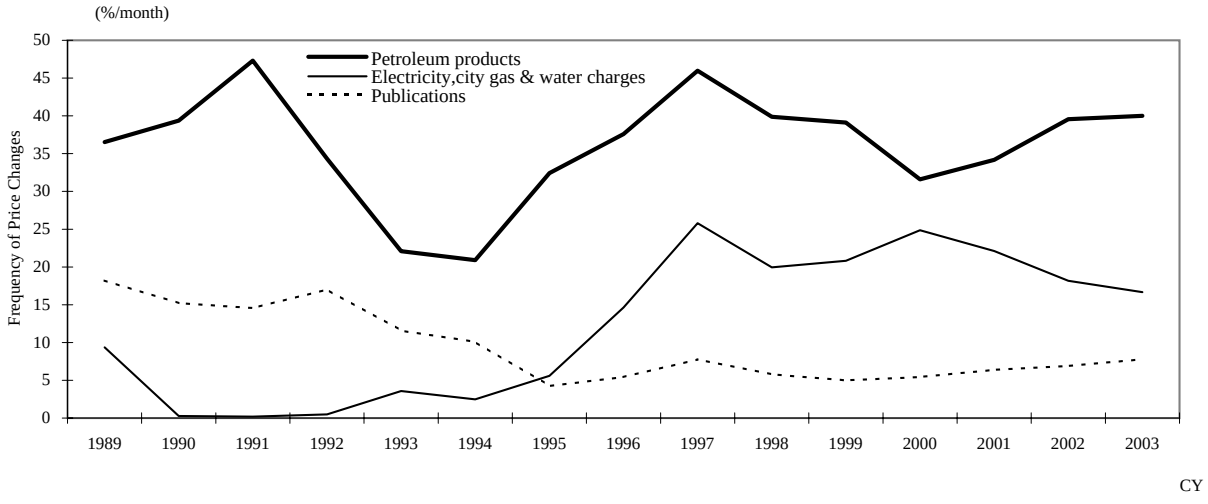
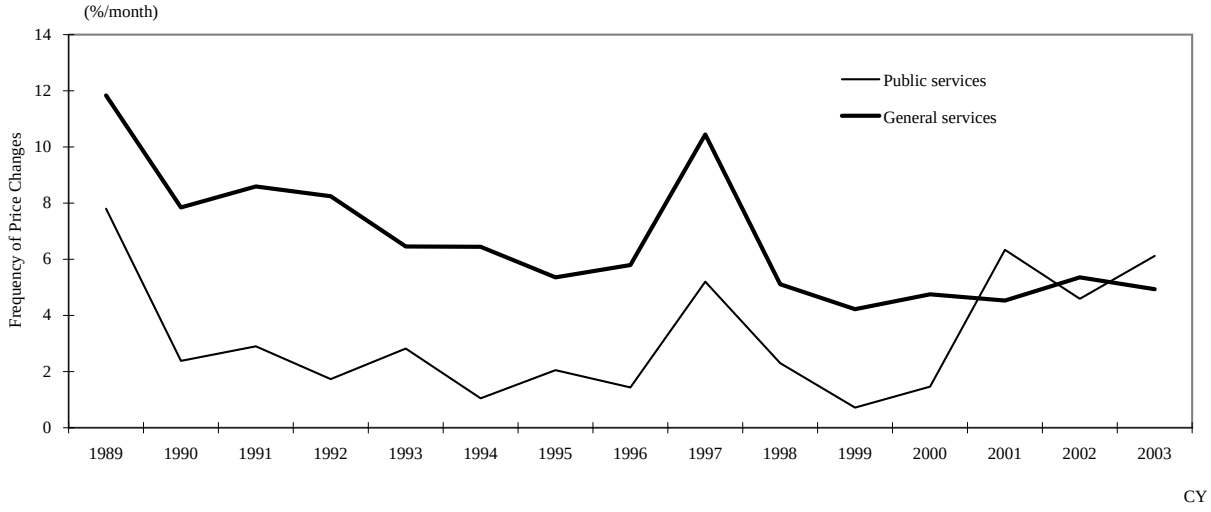
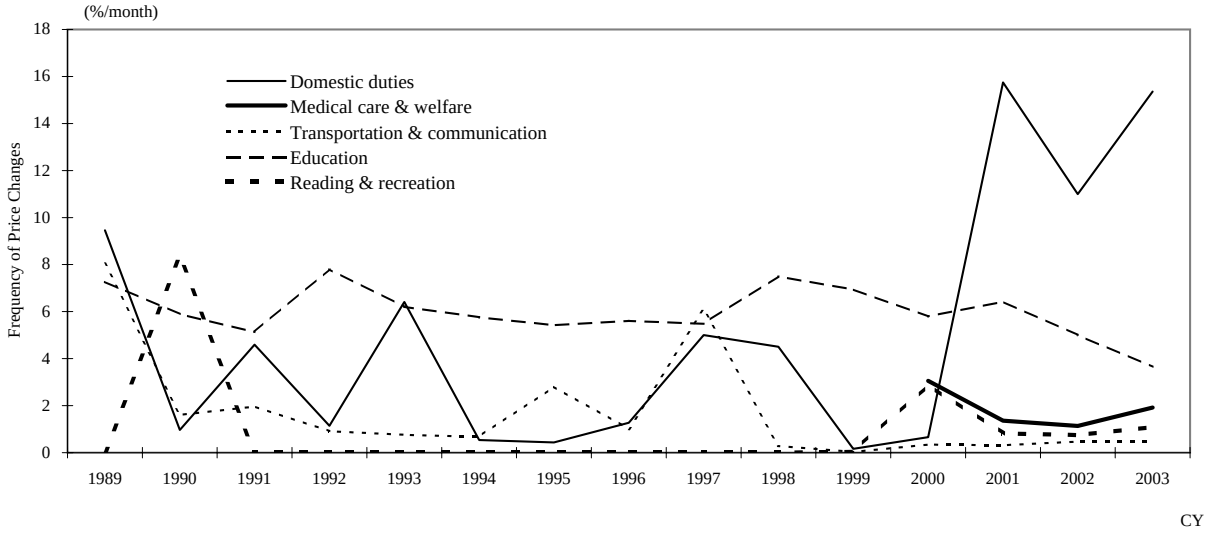


Chart 9. Frequency of Price Changes by Year (CY1989 to 2003): Services

(1) Public and General Services



(2) Breakdown of Public services



(3) Breakdown of General services

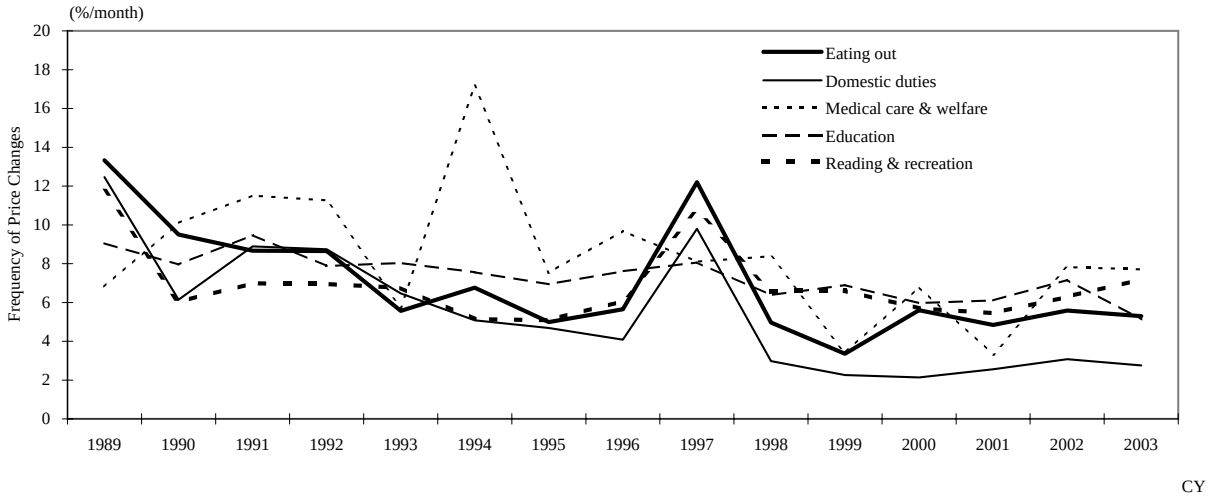
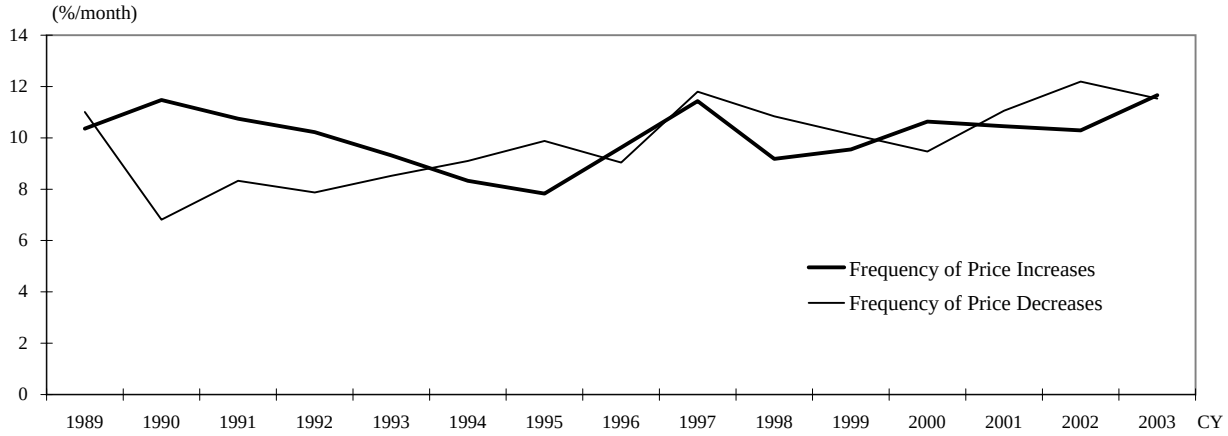
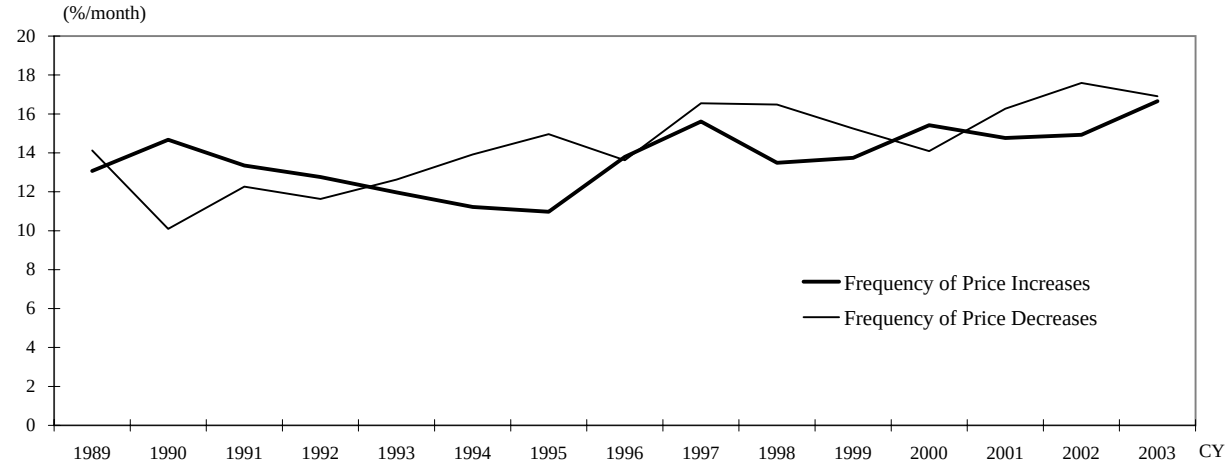


Chart 10. Changes in the Frequency of Price Increases and Decreases (CY1989 to 2003)

(1) Total



(2) Goods



(3) Services

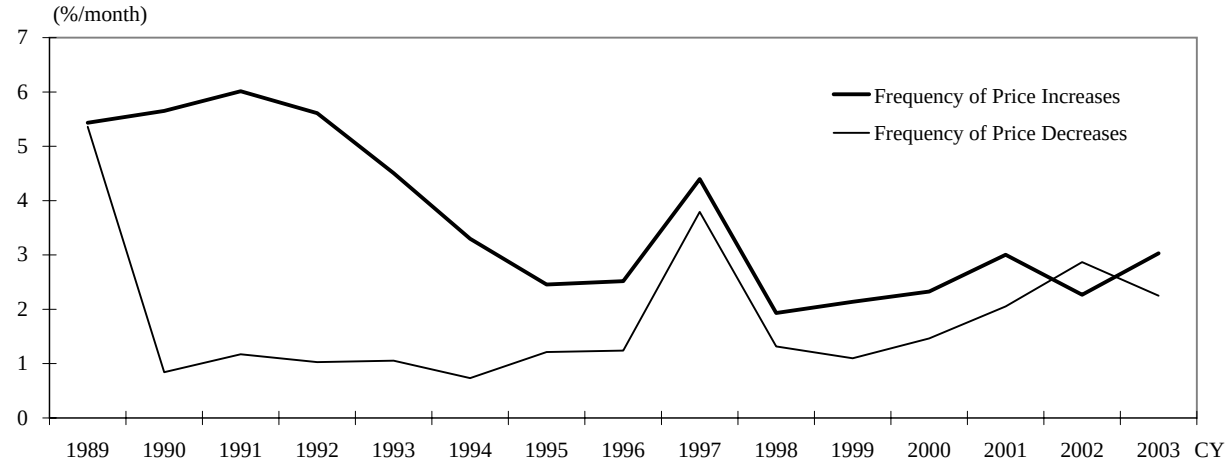
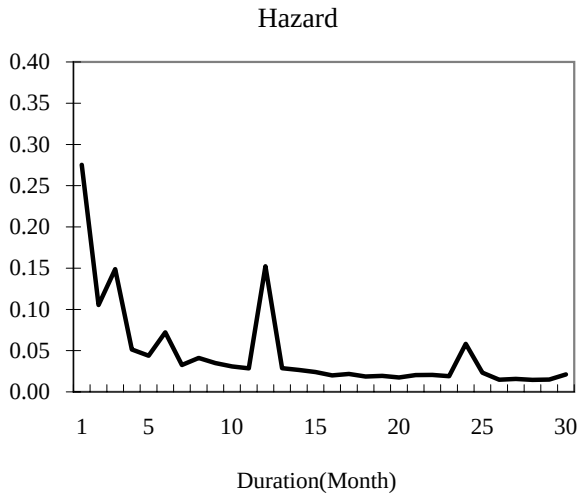
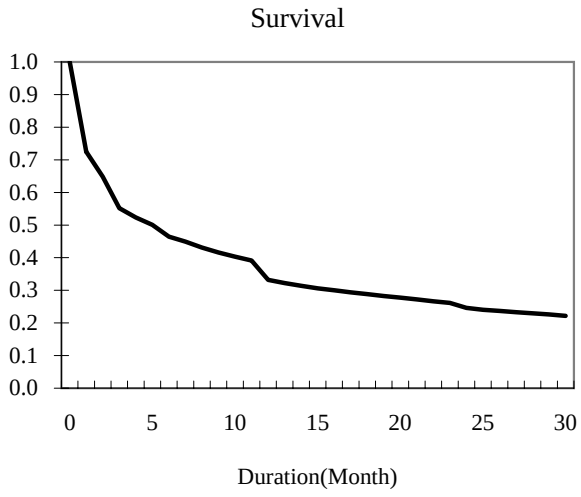


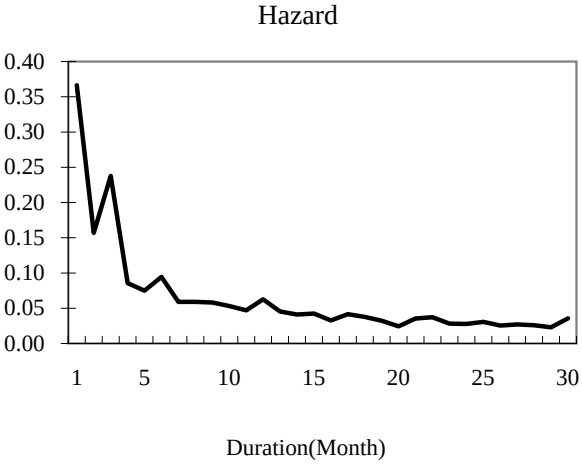
Chart 11. Hazard Function and Survival Ratio

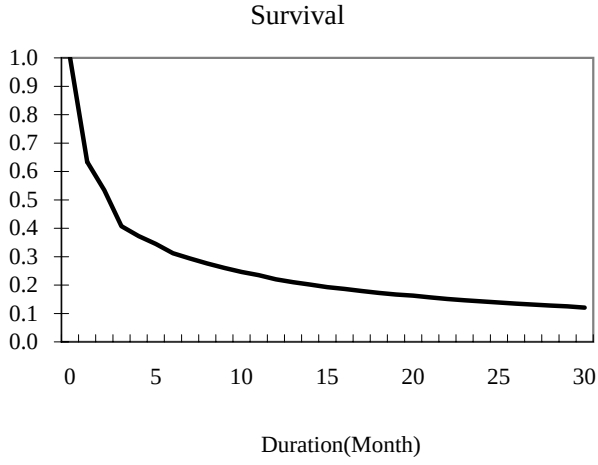
(1) Total



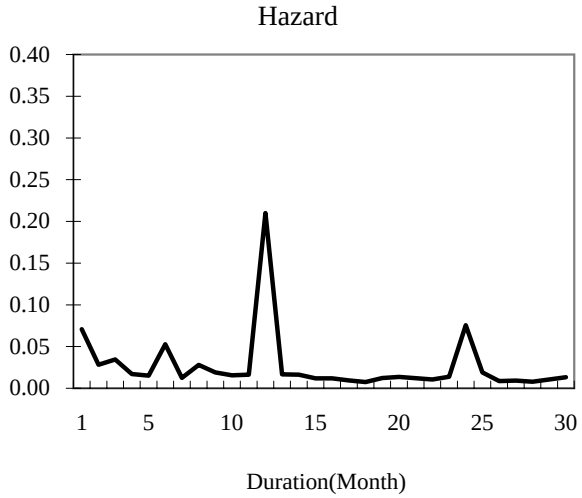


(2) Goods





(3) Services



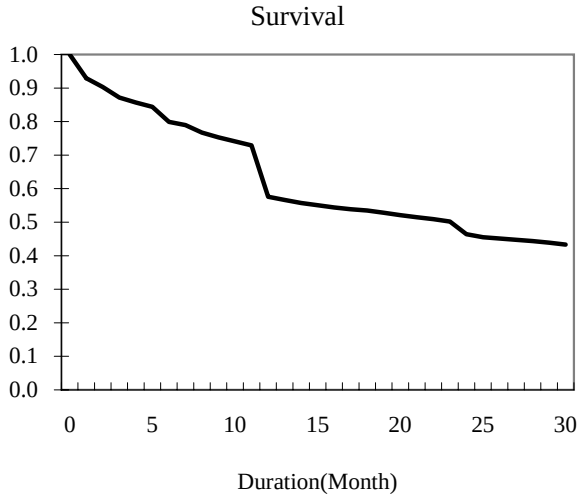
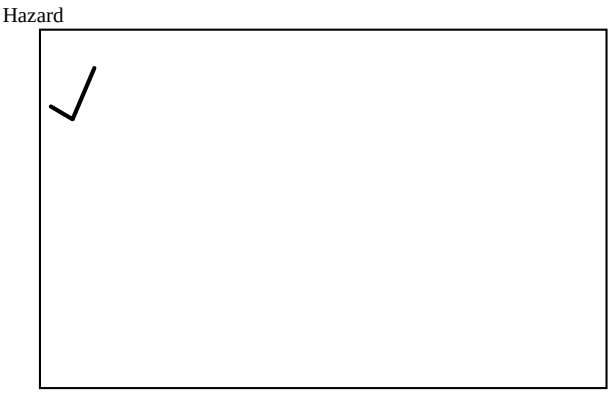


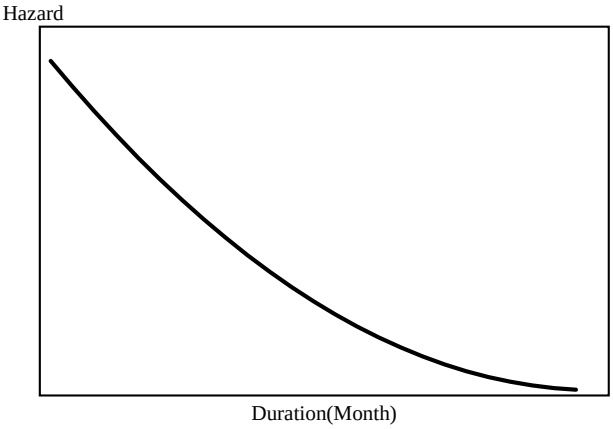
Chart 12. Hazard Function by Type

(1) Flexible



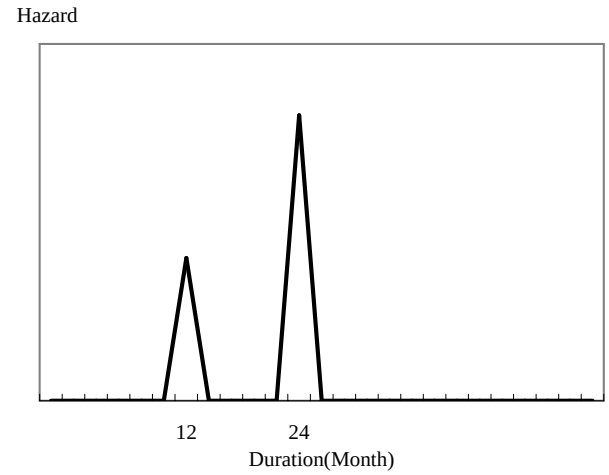
	Category (Item)
Goods	Fresh food, Hen Eggs, Cut Flowers
Services	None

(2) Downward sloping



	Category (Item)
Goods	Items other than Fresh food and Electricity and gas charges
Services	General Services (Eating out, Domestic duties, and Reading and recreation)

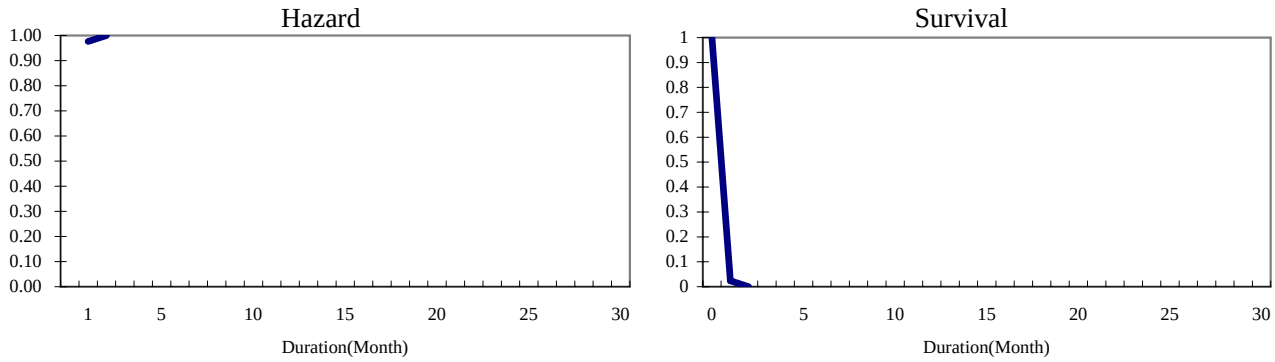
(3) Taylor



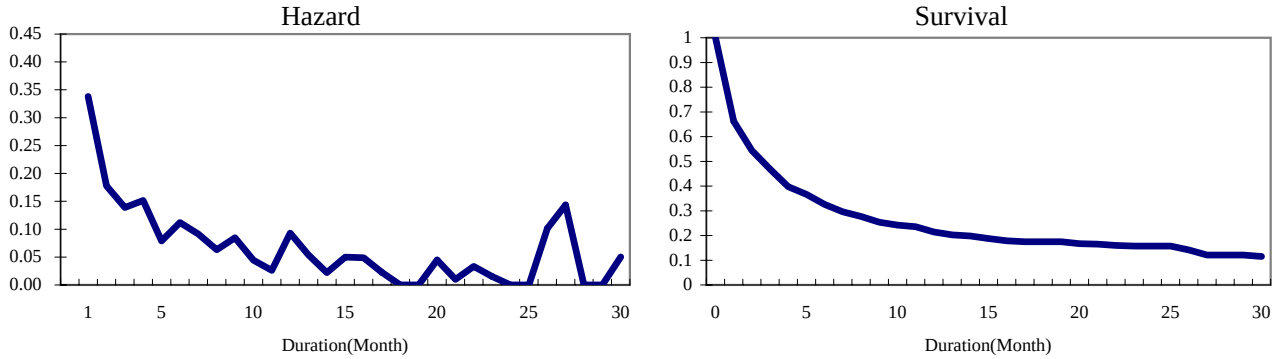
	Category (Item)
Goods	Electricity and gas charges
Services	Public Services, General Services (Medical care & welfare, Education, a part of Reading and recreation <Lesson fees>)

Chart 13. Hazard Function and Survival Ratio by Type

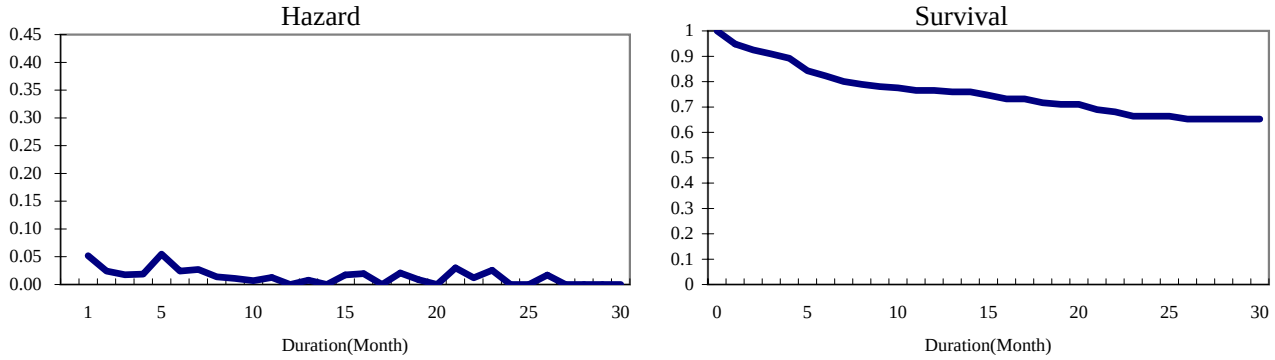
(1) Flexible: e.g.) Tomato



(2-1) Downward sloping: e.g.) Fruit drinks



(2-2) Downward sloping: e.g.) Permanent wave charges



(3) Taylor: e.g.) School fees <public senior high school>

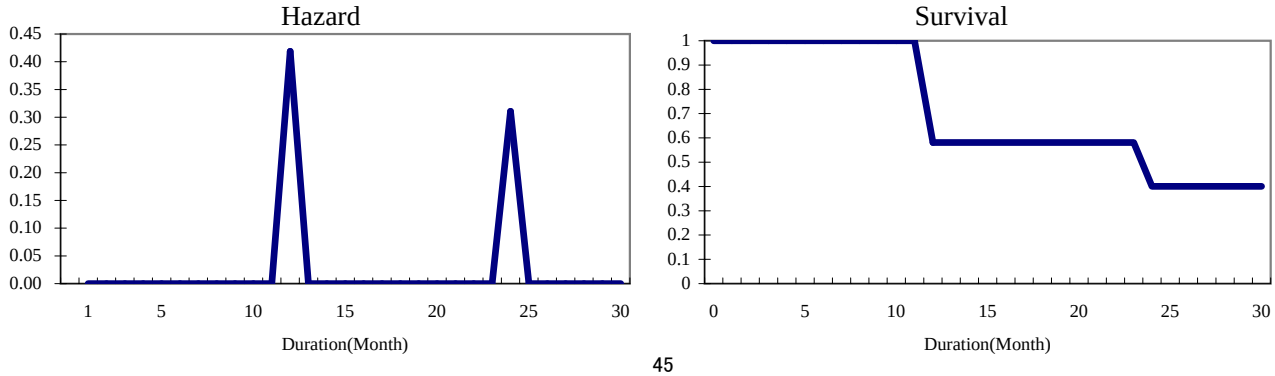
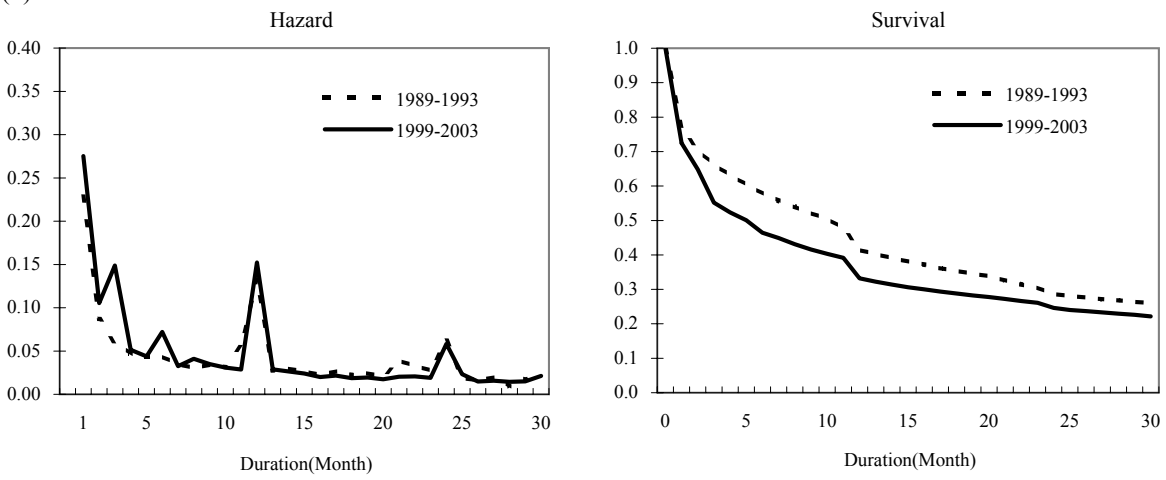
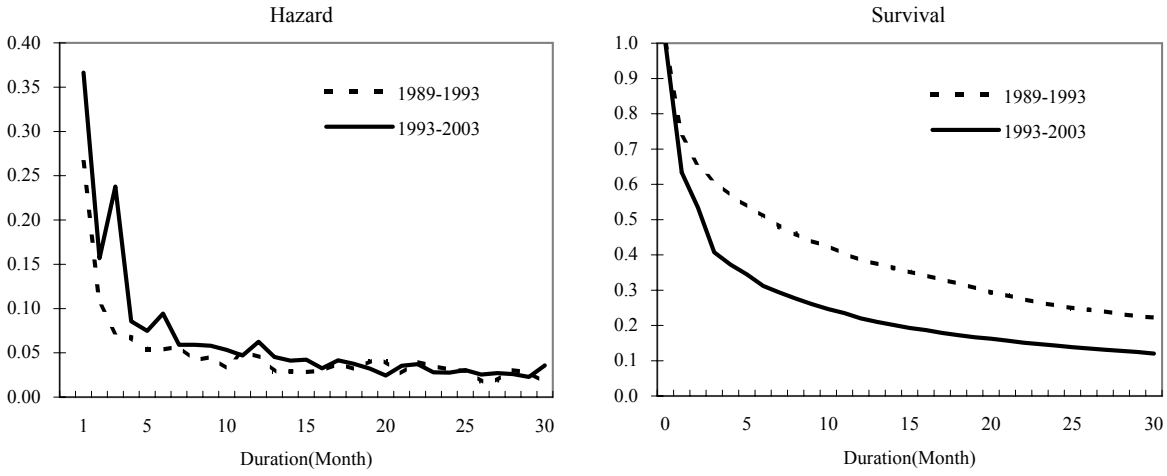


Chart 14. Changes in the Hazard Function and the Survival Ratio
CY1989 to 1993→CY1999 to 2003

(1) Total



(2) Goods



(3) Services

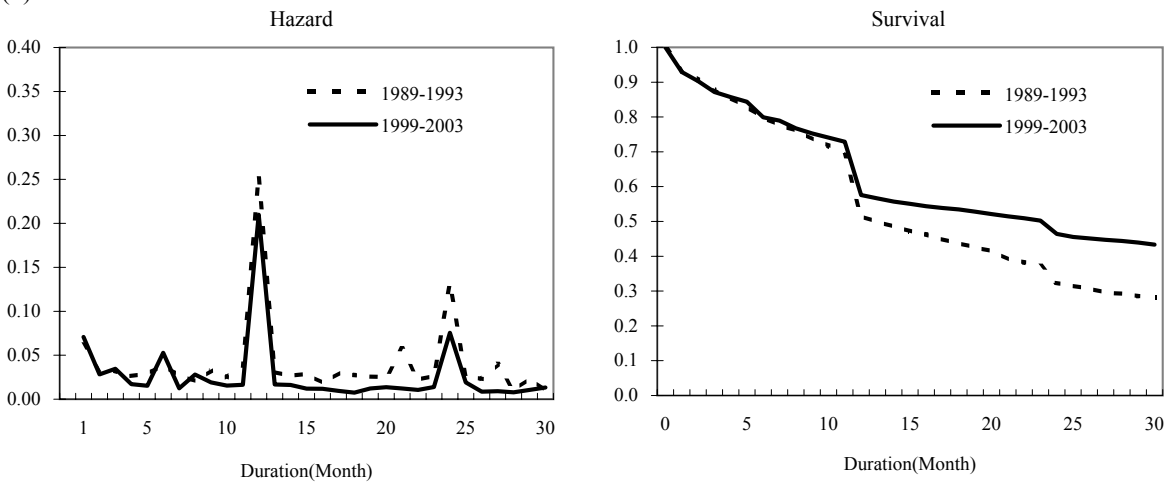
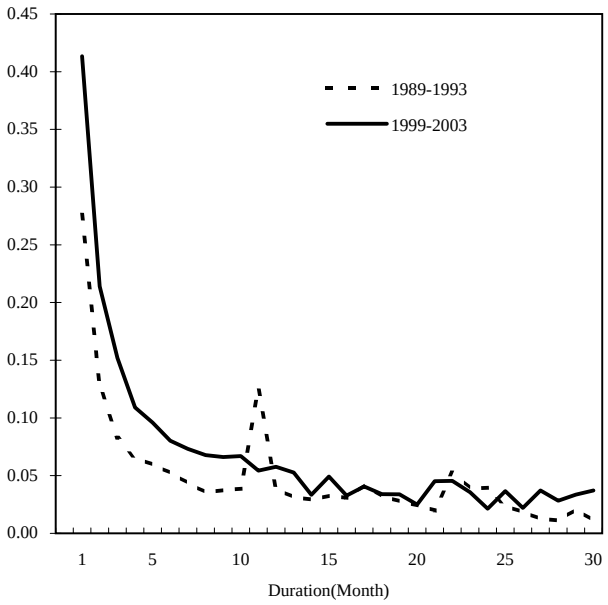


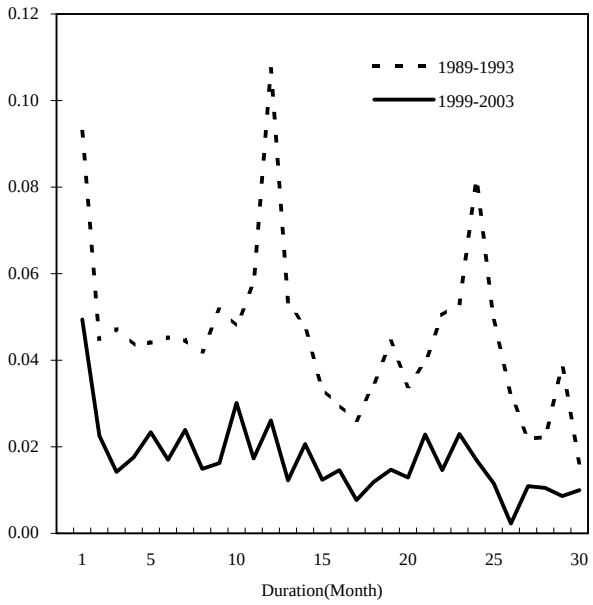
Chart 15. Changes in the Hazard Function

(1) By Cagetory

(a) Food Products

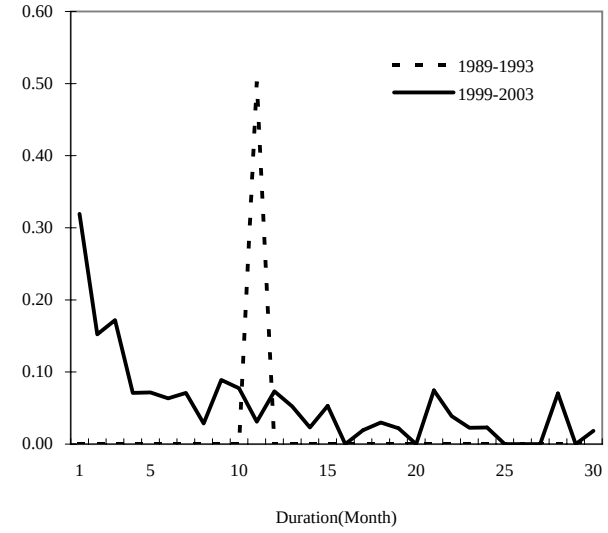


(b) General Services, domestic duties



(2) By Item

(a) Beer



(b) Plumbing

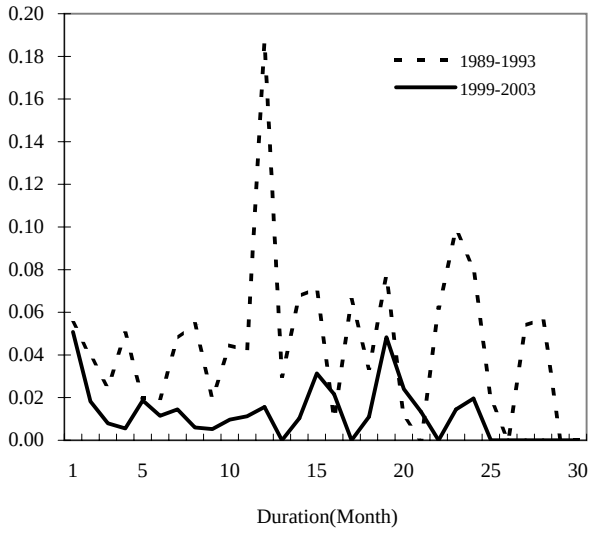
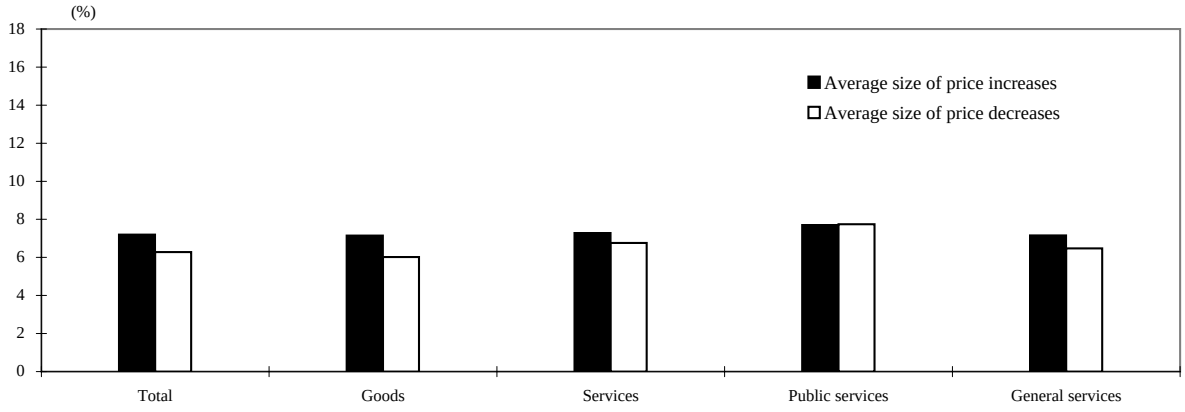
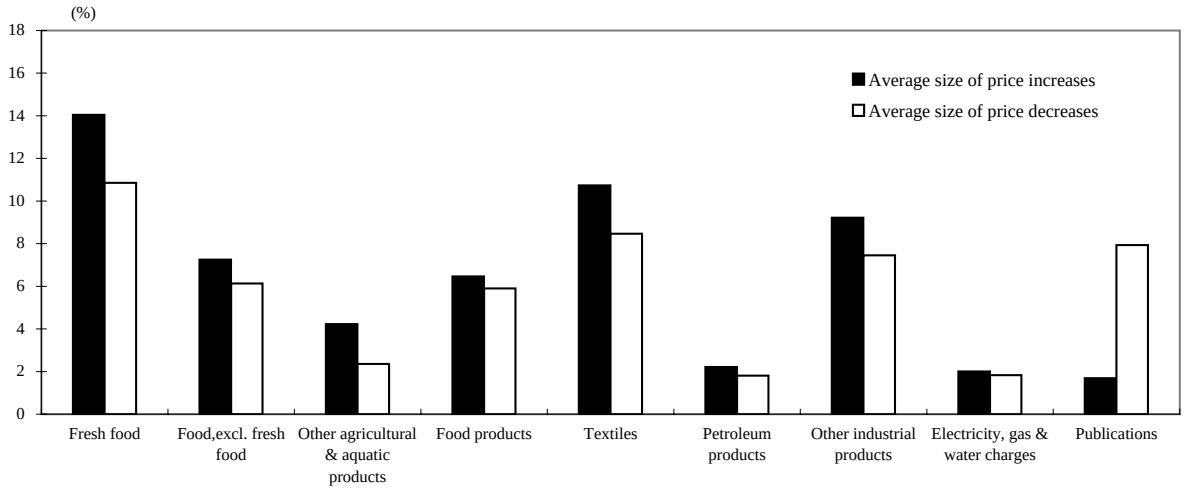


Chart 16. Average Size of Price Changes (CY1999 to 2003)

(1) Total, Goods, and Services



(2) Goods by Category



(3) Services by Category

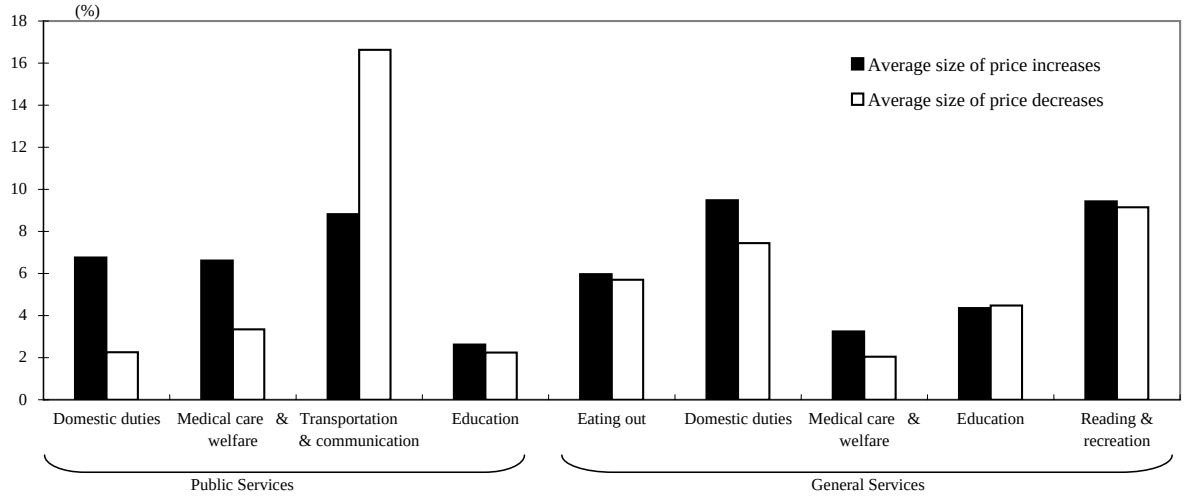
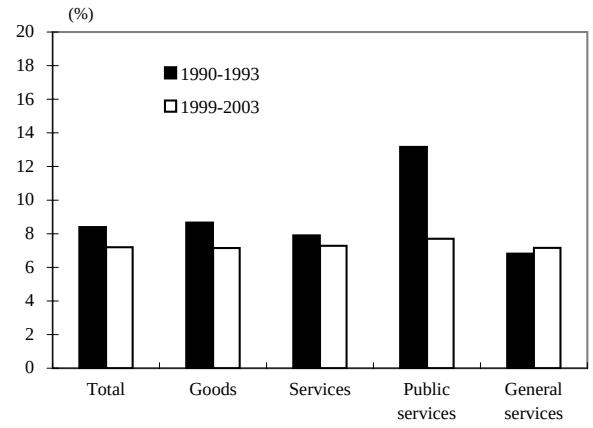


Chart 17. Changes in the Average Size of Price Changes by Category

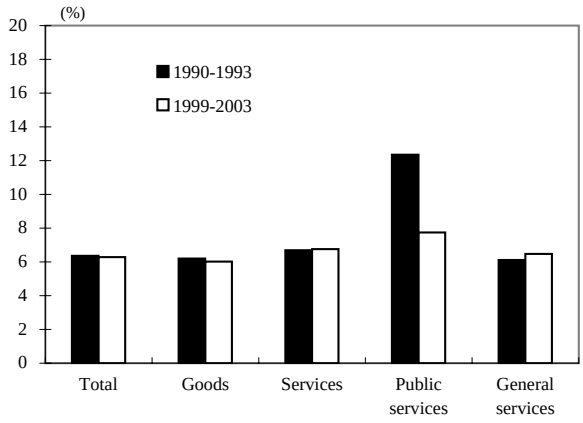
CY1990-1993 to CY1999-2003

(1) Total, Goods, and Services

(a) Average Sizes of Price Increases

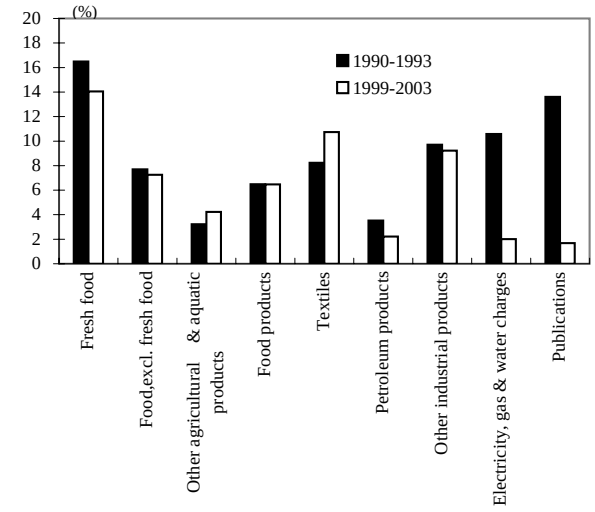


(b) Average Sizes of Price Decreases

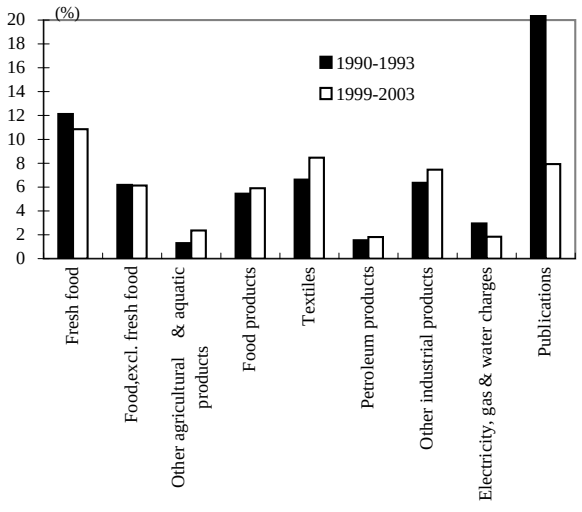


(2) Goods by Category

(a) Average Sizes of Price Increases

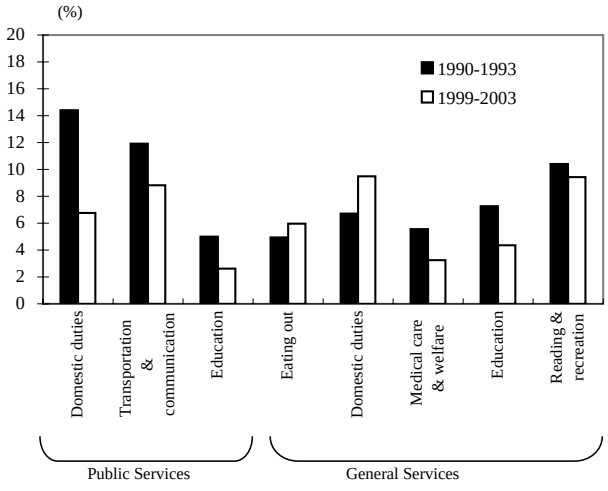


(b) Average Sizes of Price Decreases



(3) Services by Category

(a) Average Sizes of Price Increases



(b) Average Sizes of Price Decreases

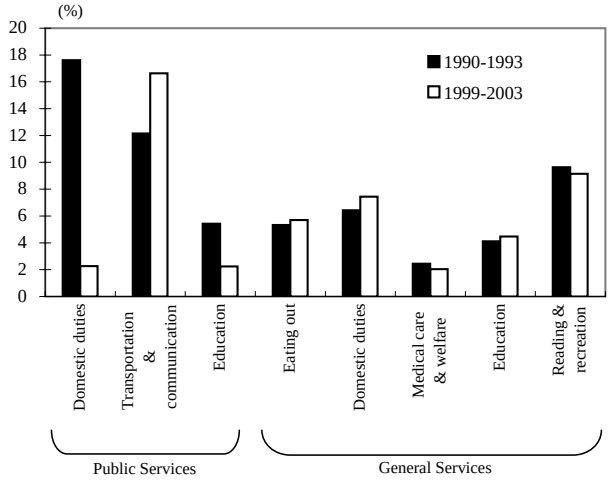
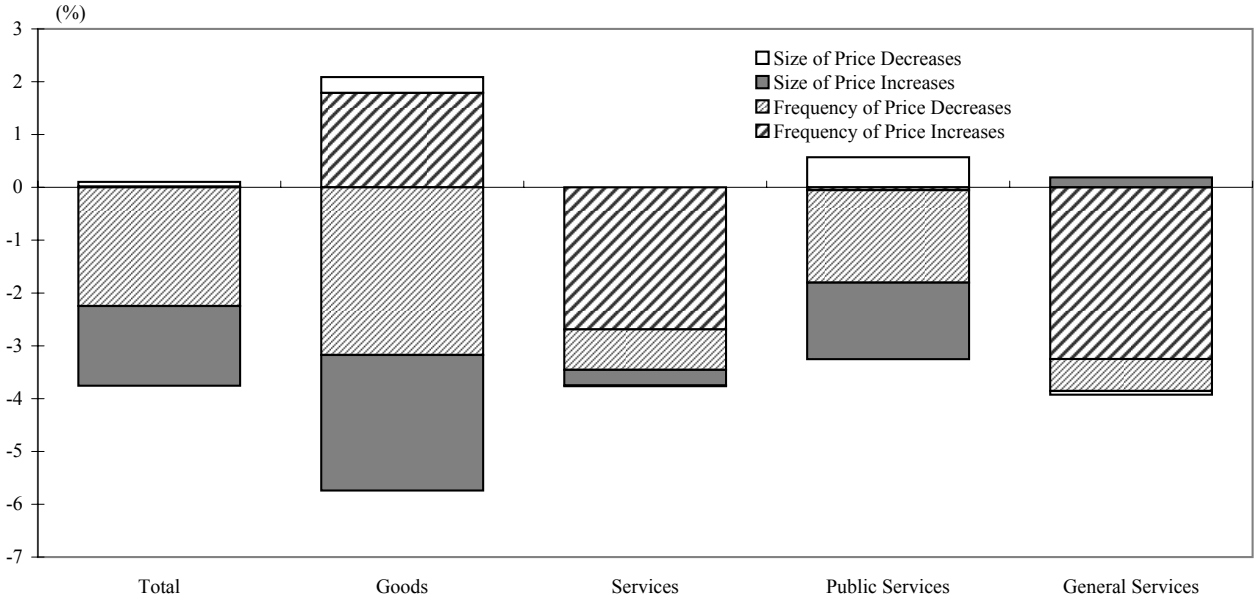


Chart 18-1. Breakdown of the Changes in Inflation Rate (1)

CY1990-1993 to CY1999-2003



Changes in the inflation rate is broken down as below. Figures are in annual.

Inflation rate (π) = (Frequency of price increases (Fi) * Average size of a price increase (Si))
+ (Frequency of price decreases (*Fd*) * Average size of a price decrease (*Sd*))

$$\pi = F_i S_i - F_d S_d \qquad \text{(equation 1)}$$

Thus, changes in the inflation rate is defined as

$$\Delta\pi = (F_{u2}S_{u2} - F_{d2}S_{d2}) - (F_{u1}S_{u1} - F_{d1}S_{d1}), \qquad \text{(equation 2)}$$

where subscript 1 and 2 denote CY1990-1993 and CY1999-2003, respectively.

As shown below, equation 2 can be solved in two ways depending on the base year.

A $$\Delta\pi = \{(F_{u1} + \Delta F_u)(S_{u1} + \Delta S_u) - (F_{d1} + \Delta F_d)(S_{d1} + \Delta S_d)\} - (F_{u1}S_{u1} - F_{d1}S_{d1})$$
$$= \underbrace{F_{u1}\Delta S_u - F_{d1}\Delta S_d}_{\text{Contribution of the Frequency (A)}} + \underbrace{S_{u1}\Delta F_u - S_{d1}\Delta F_d}_{\text{Contribution of the Size (A)}} + \underbrace{\Delta F_u \Delta S_u - \Delta F_d \Delta S_d}_{\text{Residuals}}$$

or

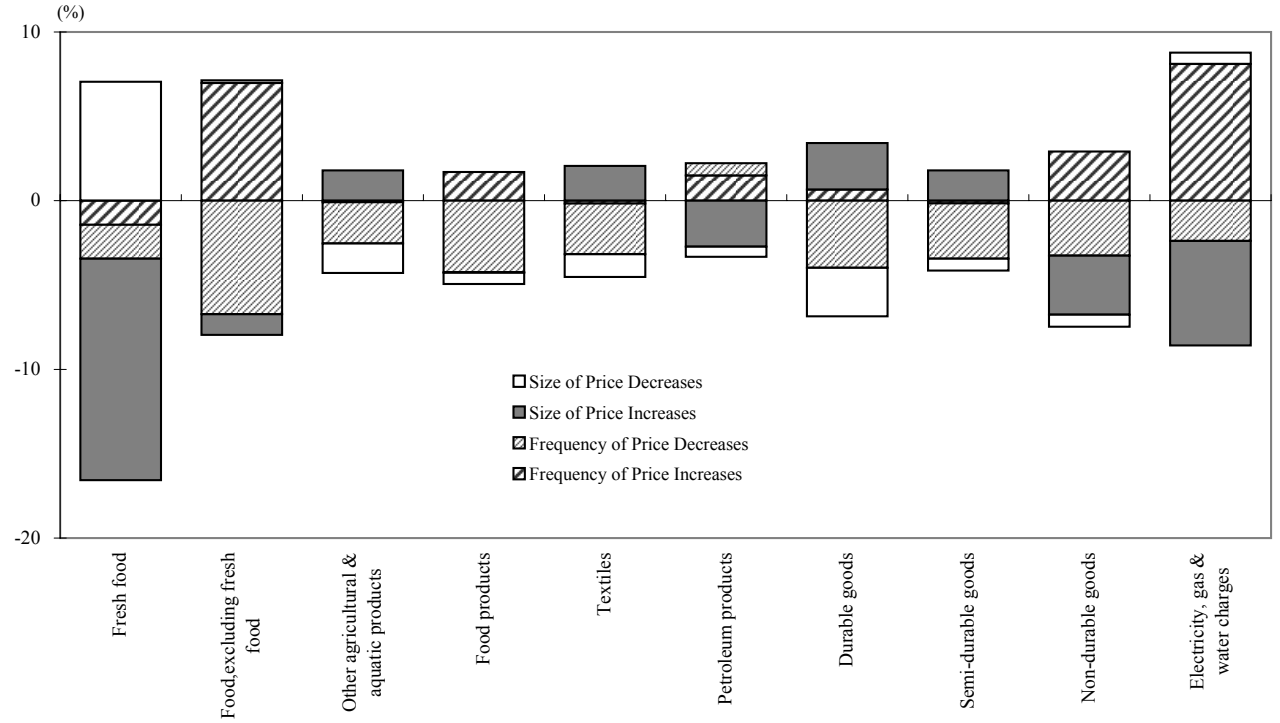
B $$\Delta\pi = (F_{u2}S_{u2} - F_{d2}S_{d2}) - \{(F_{u,2} - \Delta F_u)(S_{u,2} - \Delta S_u) - (F_{d,2} - \Delta F_d)(S_{d2} - \Delta S_d)\}$$
$$= \underbrace{F_{u2}\Delta S_u - F_{d2}\Delta S_d}_{\text{Contribution of the Frequency (B)}} + \underbrace{S_{u2}\Delta F_u - S_{d2}\Delta F_d}_{\text{Contribution of the Size (B)}} - \underbrace{\Delta F_u \Delta S_u + \Delta F_d \Delta S_d}_{\text{Residuals}}$$

Figures in the chart above is the averaged contributions of A and B.

Chart 18-2. Breakdown of the Changes in Inflation Rate (2)

CY1990-1993 to CY1999-2003

(1) Goods by Category



(2) Services by Category

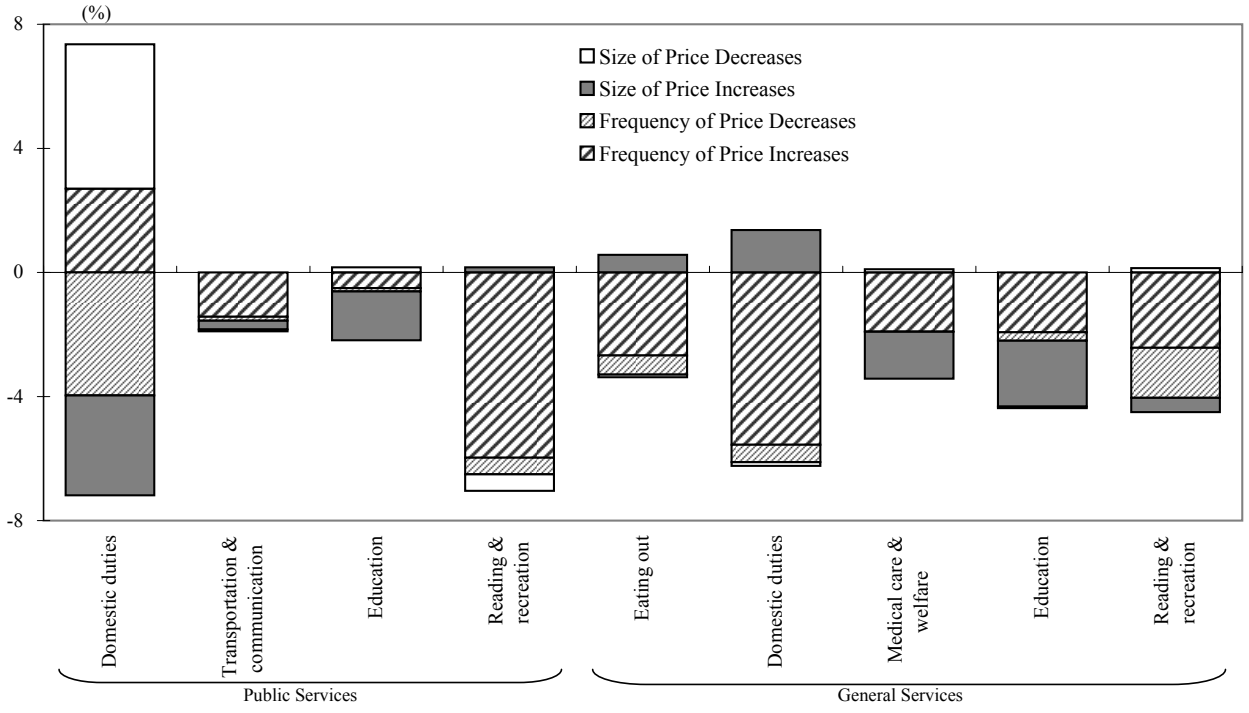
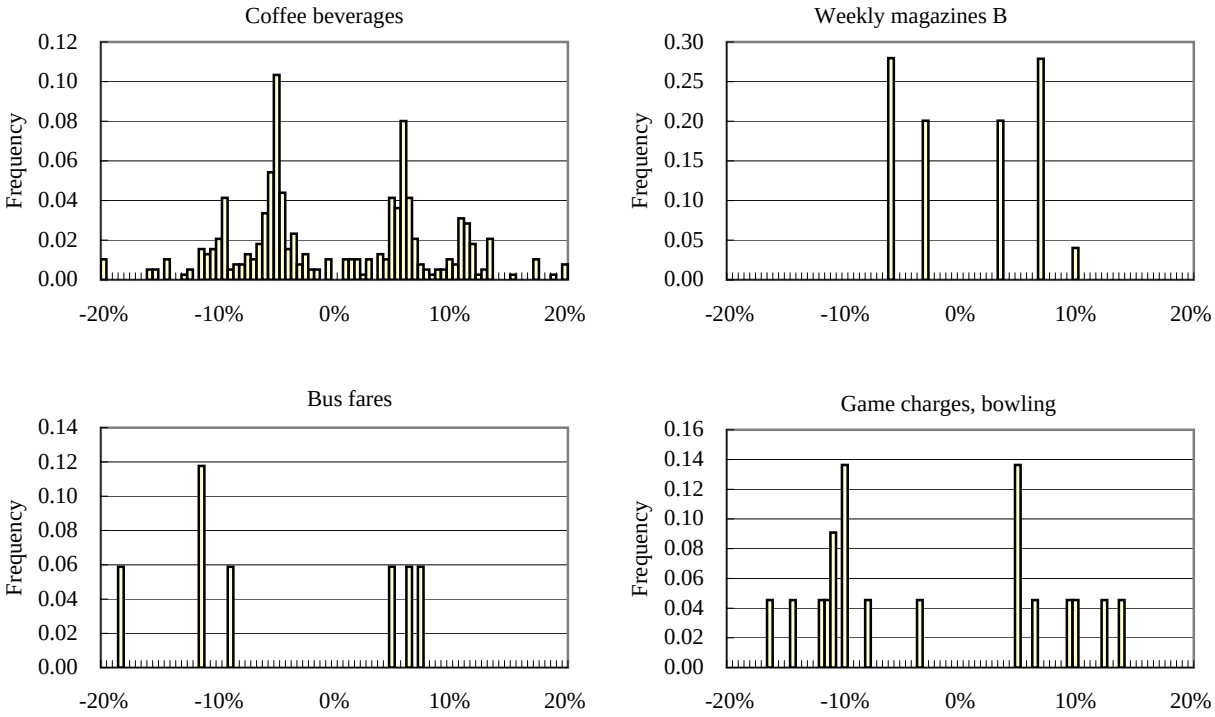


Chart 19. Frequency distribution of the Sizes of Price Changes (CY1999-2003)

(1) Lower bounds in the size of price changes exist



(2) No lower bound in the size of price changes

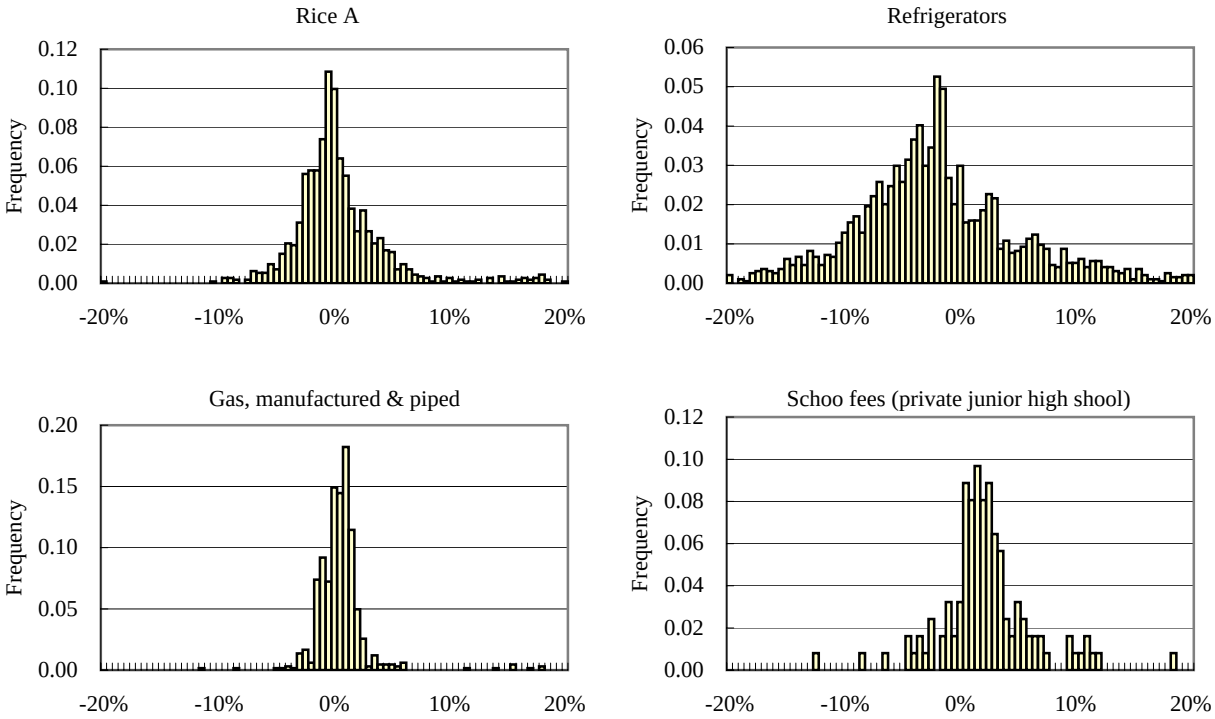
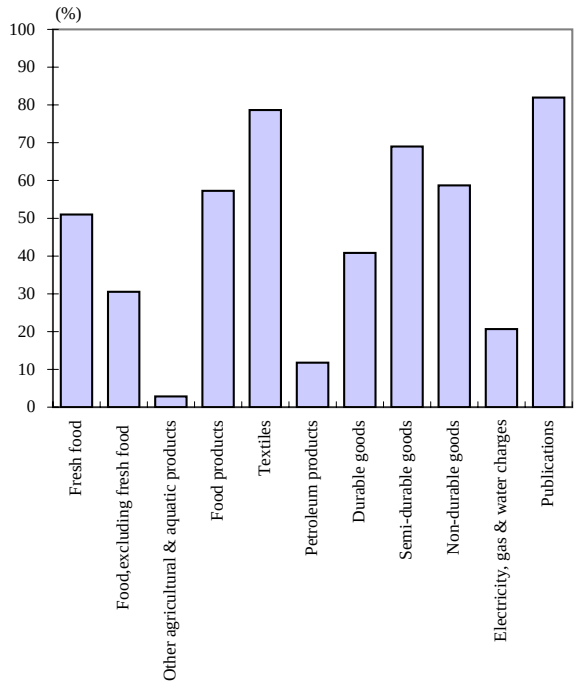


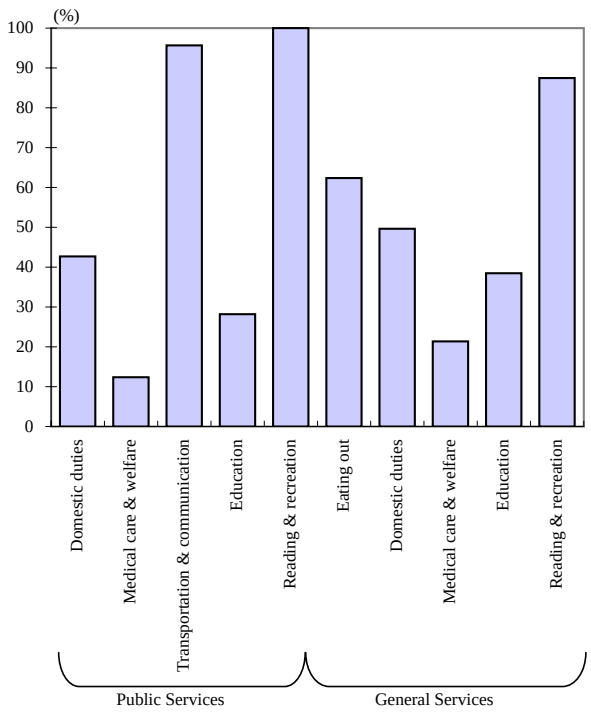
Chart 20. Distribution of the Size of Price Changes

(1) Share of items with a dip nearest to zero

(a) Goods



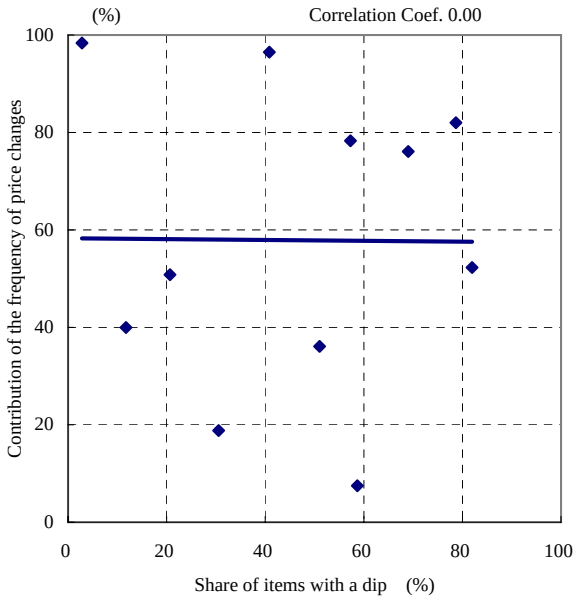
(b) Services



Note 1: Figures are in weighted basis.
Note 2: For the criterion for judging whether the distribution has a dip nearest to zero, see Appendix 3.

(2) Contribution of the frequency of price changes to the changes in inflation rate and the share of items with a dip nearest to zero

(a) Goods



(b) Services

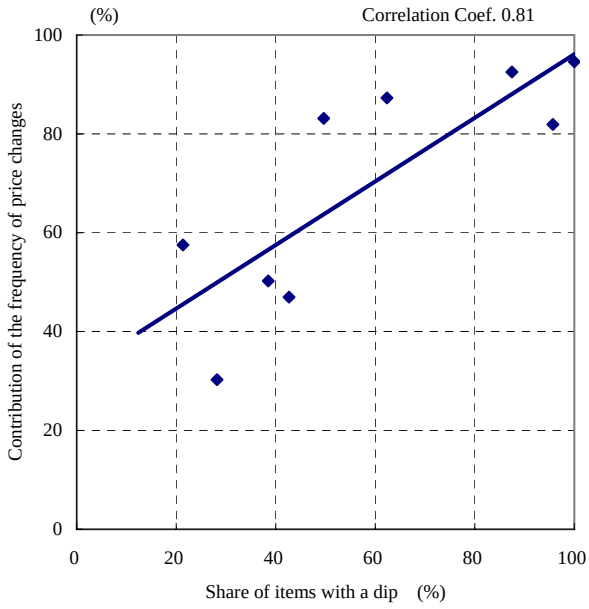
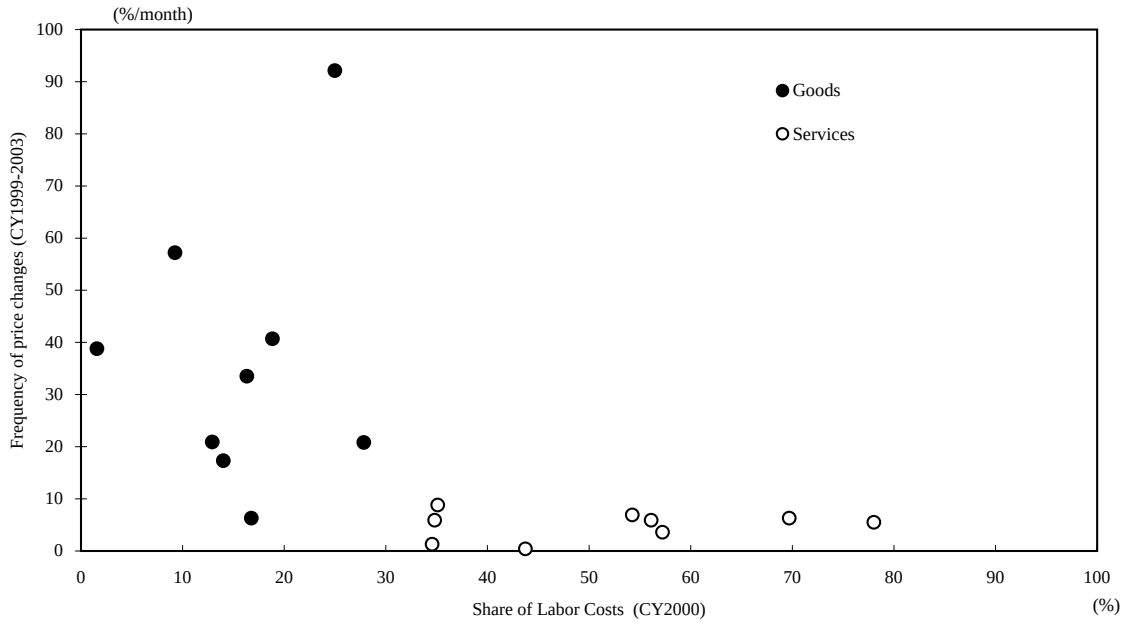
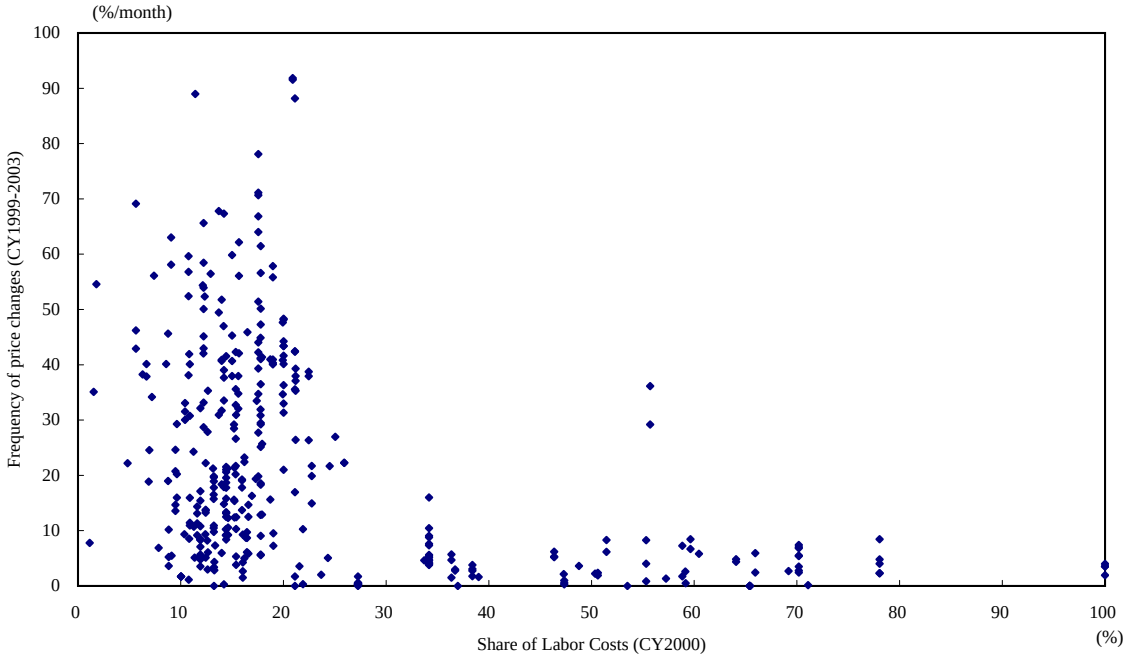


Chart 21. Share of Labor Costs and Frequency of Price Changes

(1) By Category



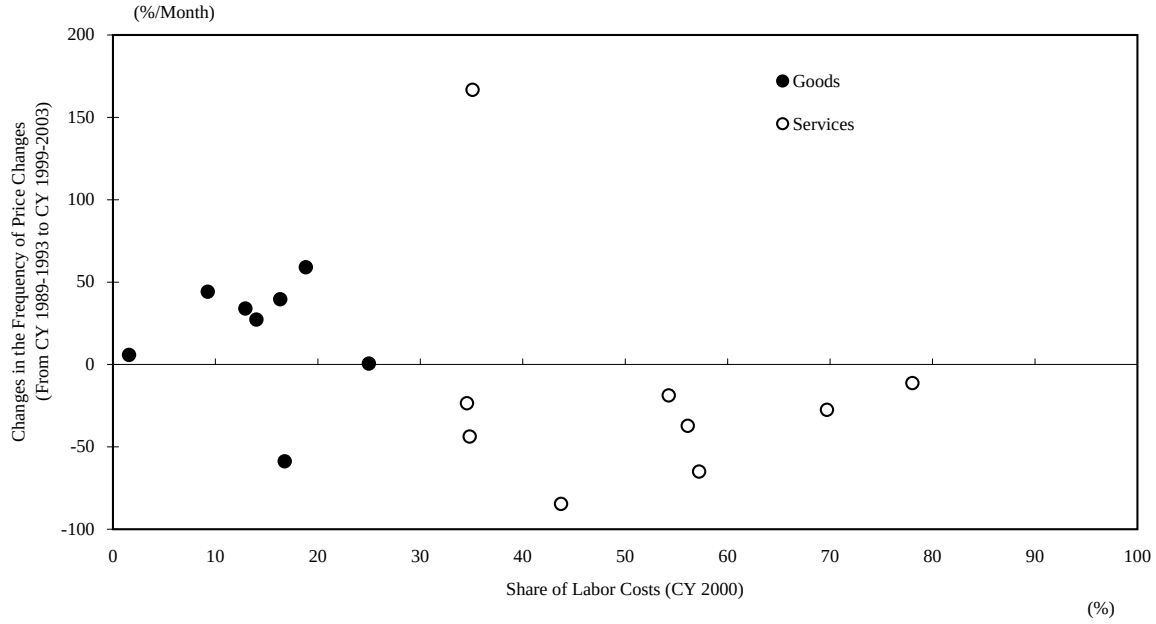
(2) By Item (Excluding Fresh Food)



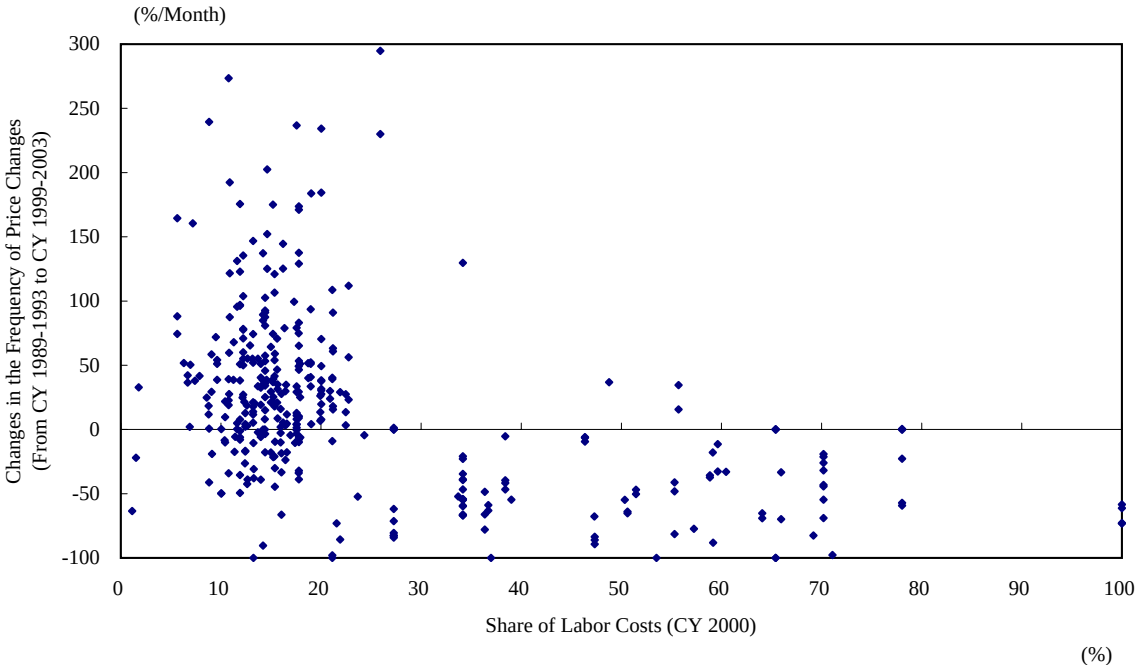
Note1: For the definition of labor cost share, see the Appendix 5.
Note2: In Figure(1), labor cost share is weighted average using CPI weight (CY2000 base).
Source: Ministry of Internal Affairs and Communication, "2000 Input-Output Table."

Chart 22. Share of Labor Costs and Changes in the Frequency of Price Changes
From CY 1989-1993 to CY 1999-2003

(1) By Category



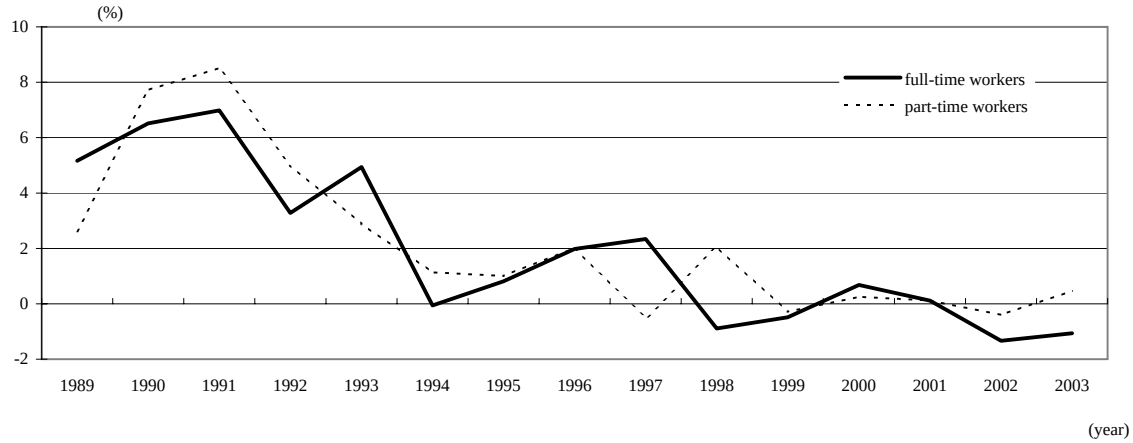
(2) By Item (Excluding fresh food)



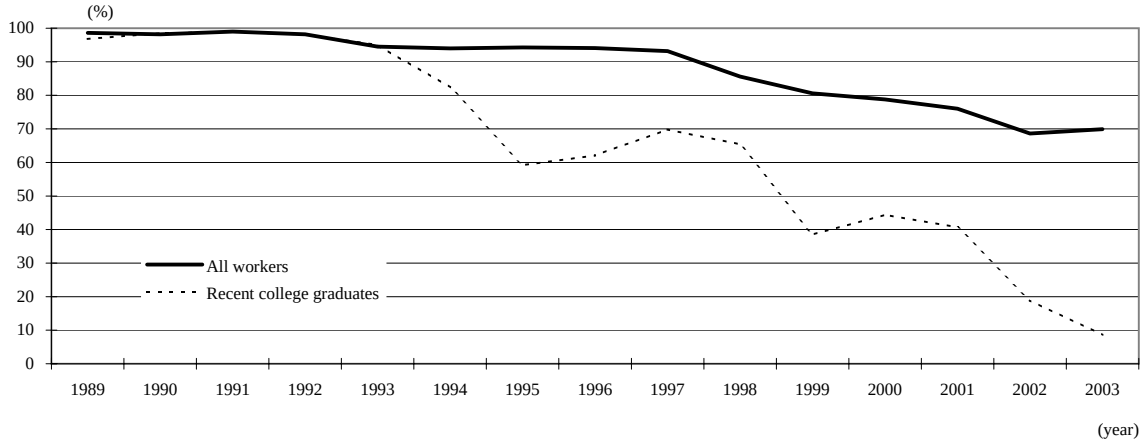
Note1: For the definition of labor cost share, see the Appendix 5.
Note2: In Figure(1), labor cost share is weighted average using CPI weight (CY2000 base).
Source: Ministry of Internal Affairs and Communication, "2000 Input-Output Table."

Chart 23. Changes in Wages and Frequency of Wage Revision

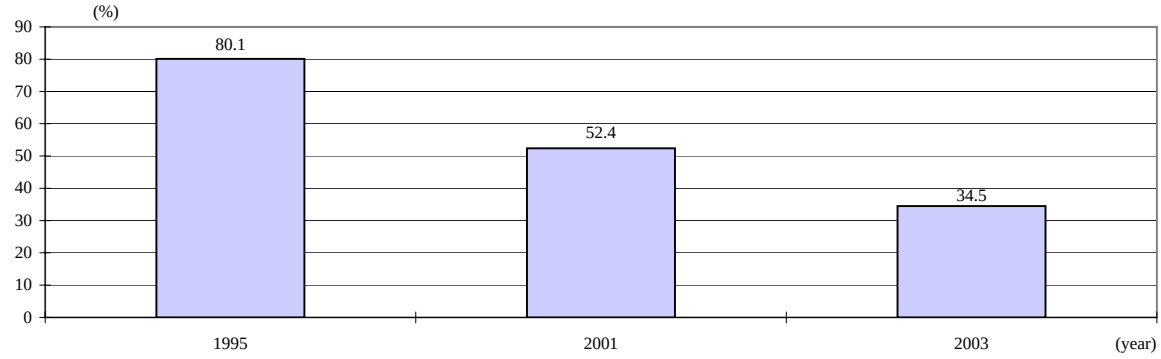
(1) Change in hourly wages



(2) Share of workers having their wages revised (Full-time workers)



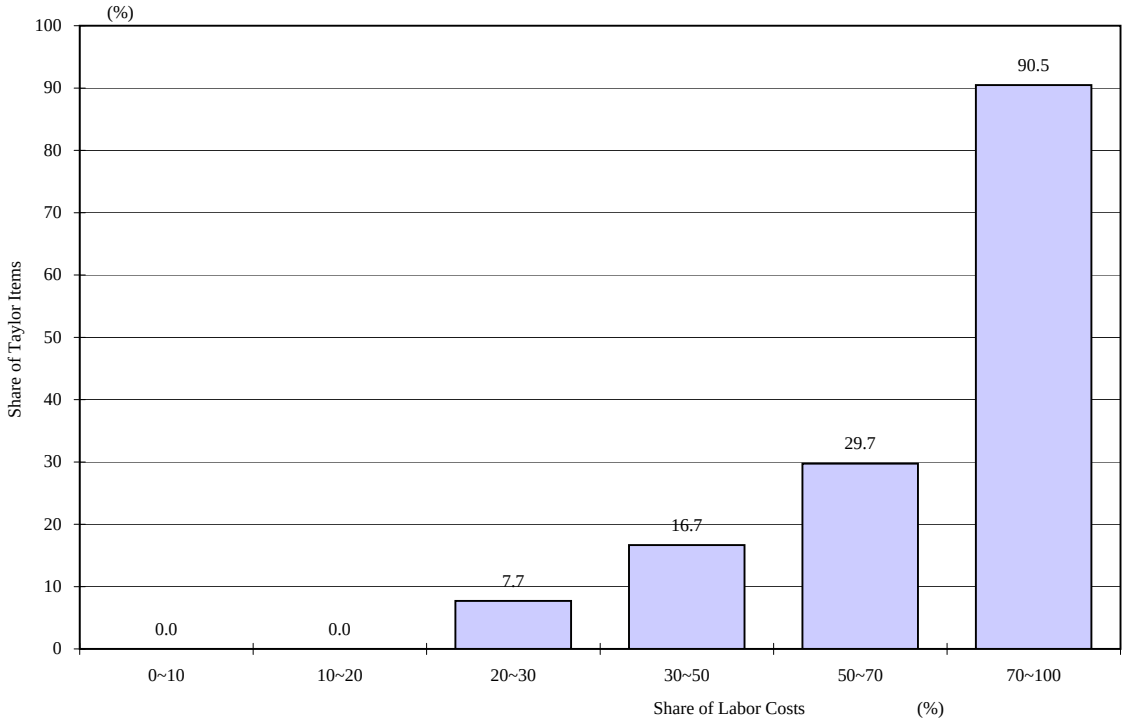
(3) Share of workers having their wages revised (Part-time workers)



Source: Ministry of Health, Labor and Welfare, "Basic Survey on Wage Structure"
Ministry of Health, Labor and Welfare, "A look at survey results of reality of wage increase"
Japan Bussiness Federation, "Survey results of recent college graduates' wage in March 2004 (2003 Nen 3 Gatsu-Sotsu Shinki-Gakusotsusha Kettei-Shoninkyu Chousa-Kekka ni Tsuite)."

Chart 24. Share of Labor Costs and Patterns of Price Changes

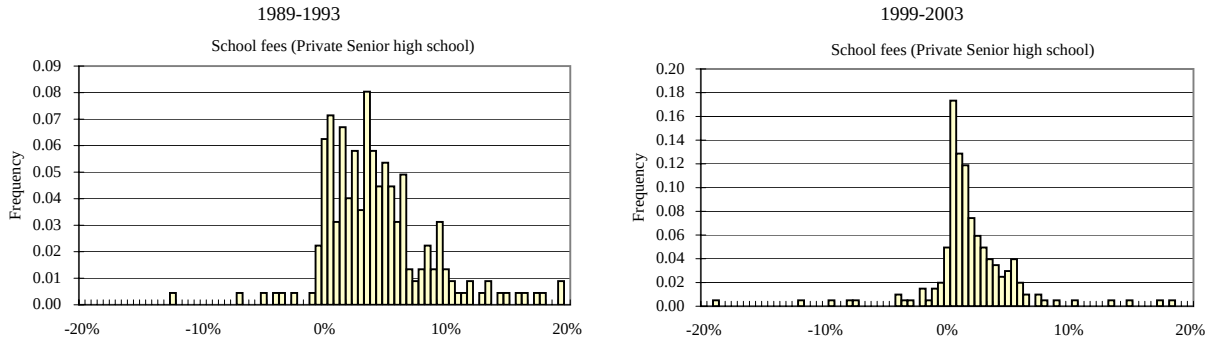
Percentage Share of Taylor Items (CY1999-2003)



Note : For the definition of the share of labor costs, see the Appendix 4.

Chart 25. Downward Nominal Rigidity in General Service Prices

(1) Downward nominal rigidity has been continued



(2) Downward nominal rigidity has disappeared.in the 1980s

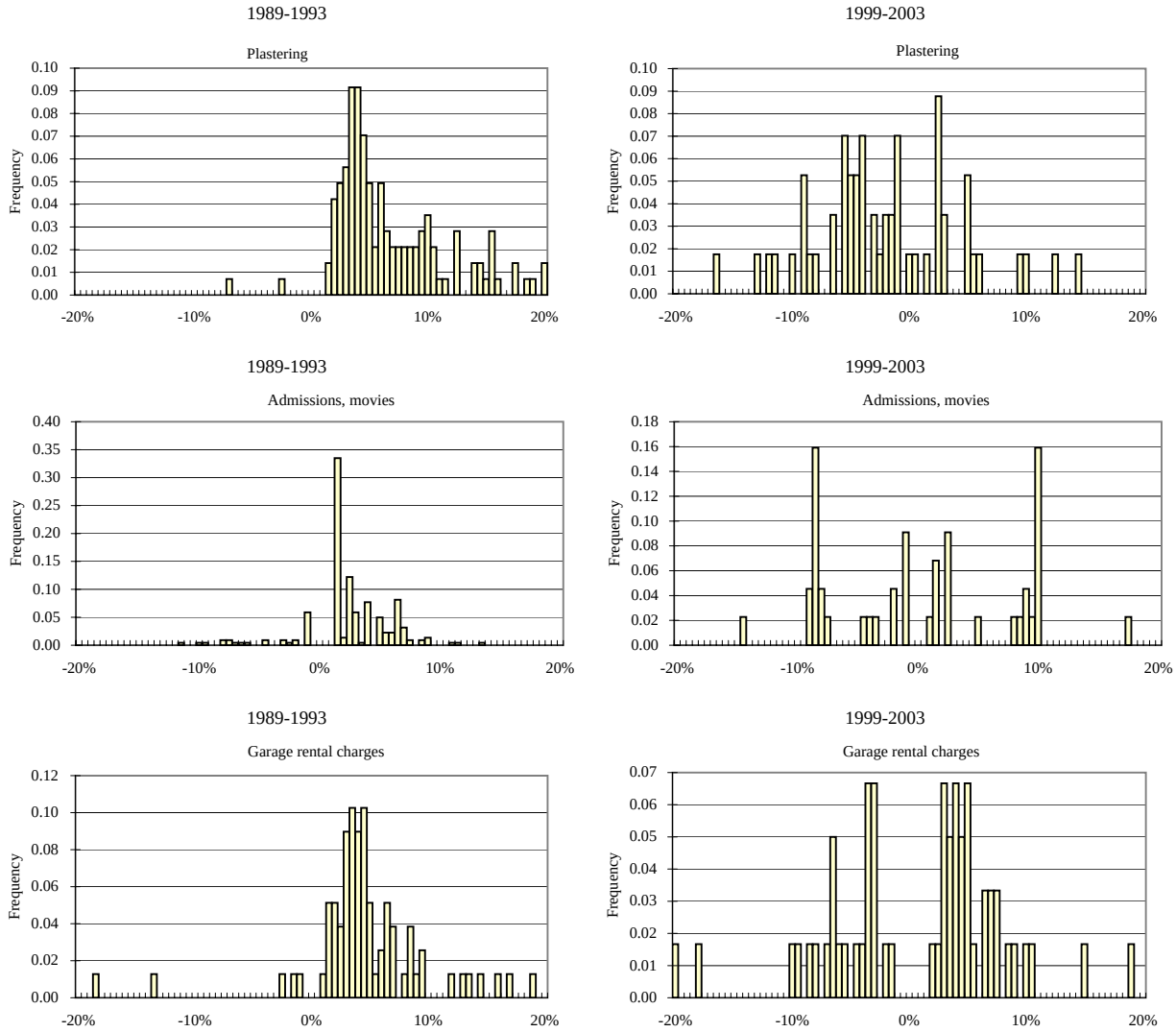
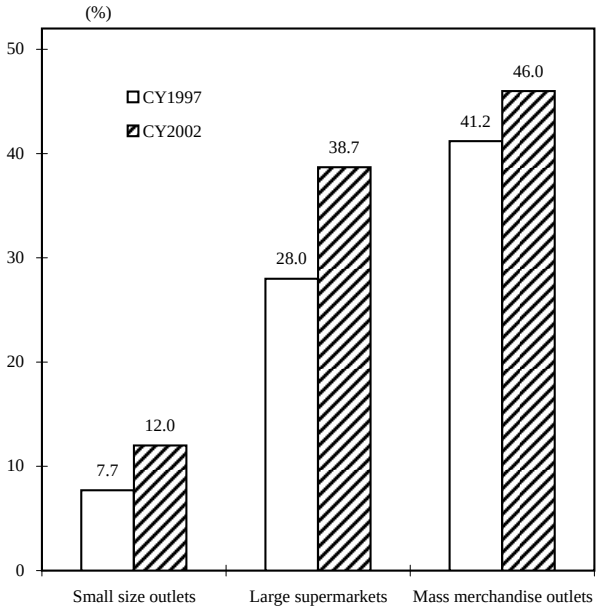
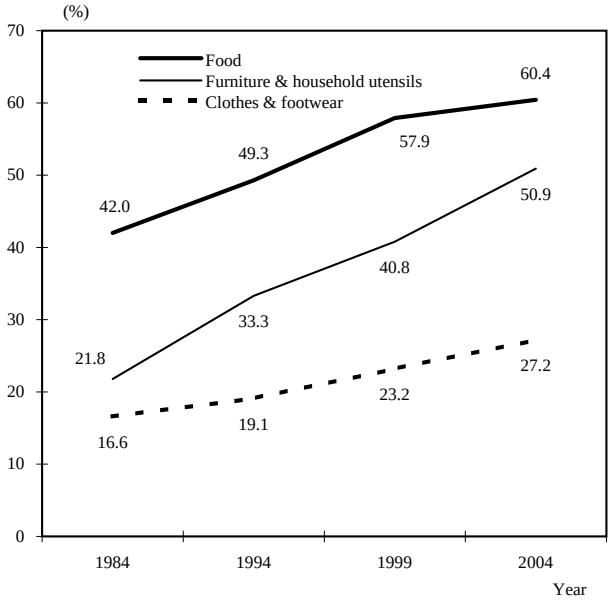


Chart 26. Changes in Competitive Environment Surrounding Retail Businesses

(1) Shares of outlets making discount sales

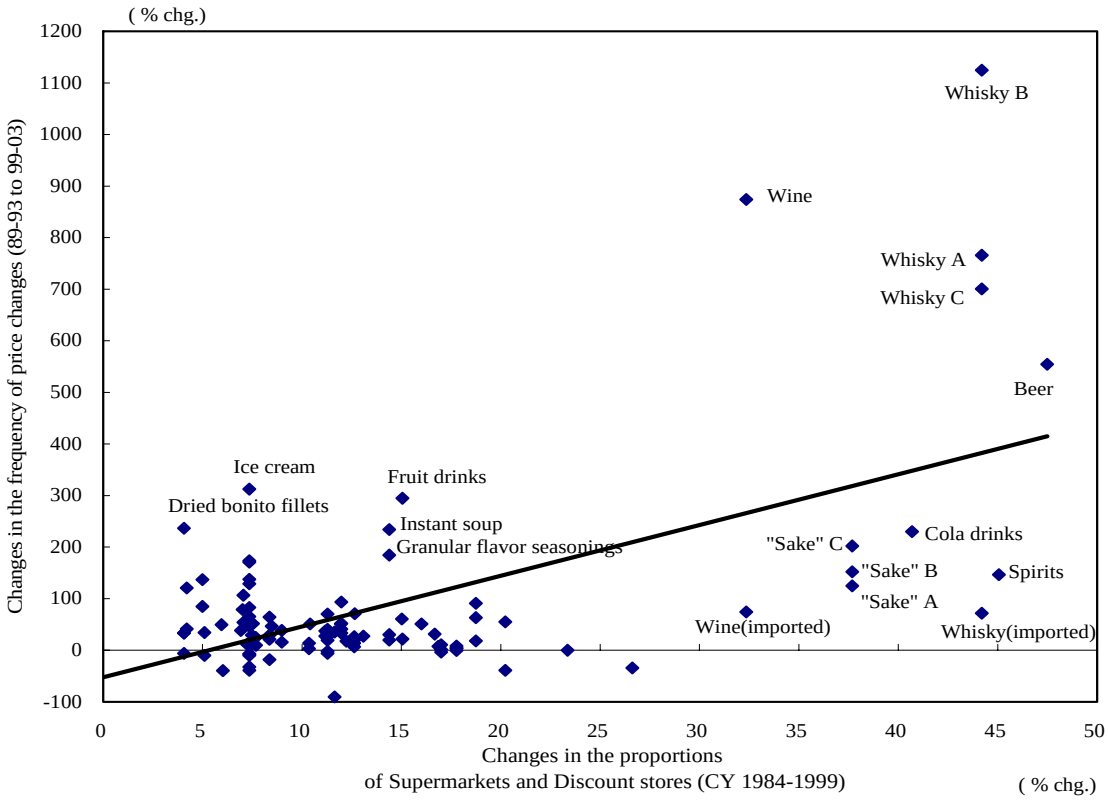


(2) Proportions of purchases at supermarkets and discount stores



(3) Proportions of purchases at supermarkets and discount stores and the frequency of price changes

(Food products)

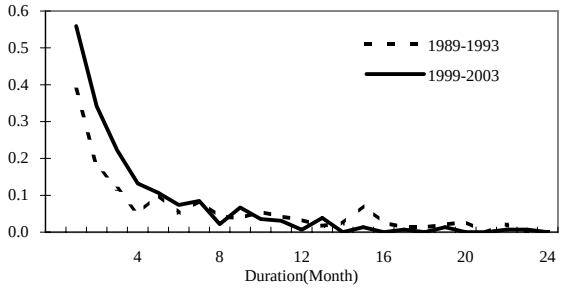


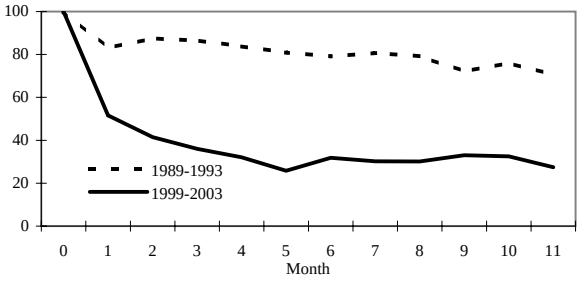
Source: Ministry of Internal Affairs and Communication, "Consumer Price Index";
"Annual Report on the Retail Price Survey"; "National Survey of Family Income and Expenditure."

Chart 27. Increases in the Temporary Price Changes

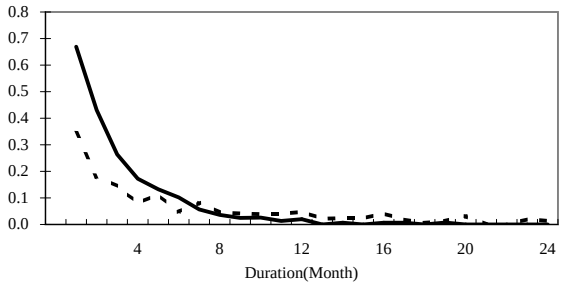
Hazard Function	Impulse Responses to Price Shocks

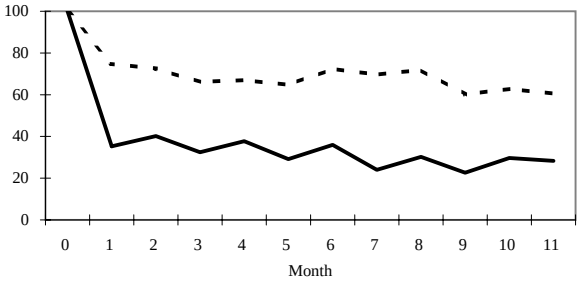
(1) Instant Noodles, Chinese



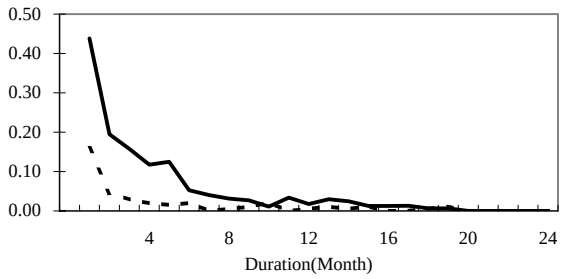


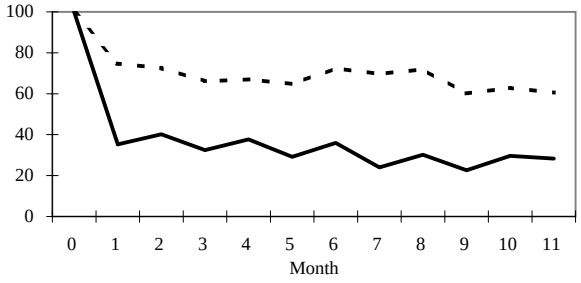
(2) Biscuits



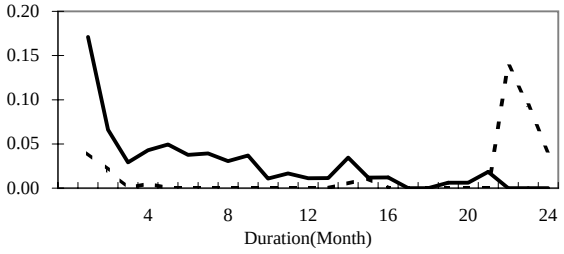


(3) Flavored Soda





(4) "Sake" A



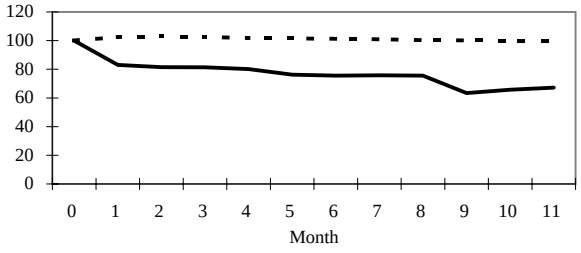
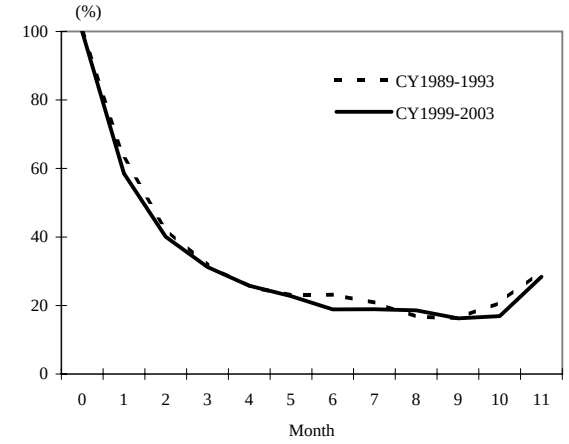
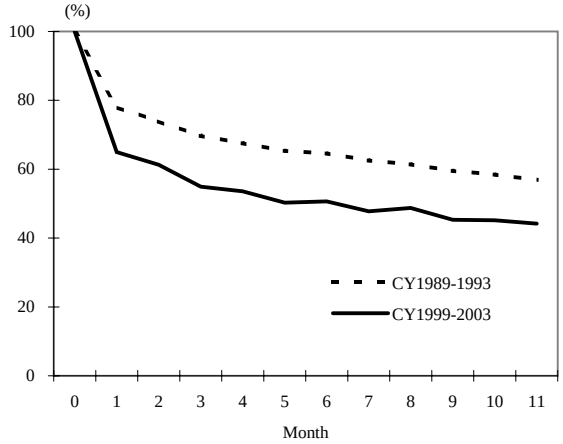


Chart 28. Impulse Responses to Price Shocks

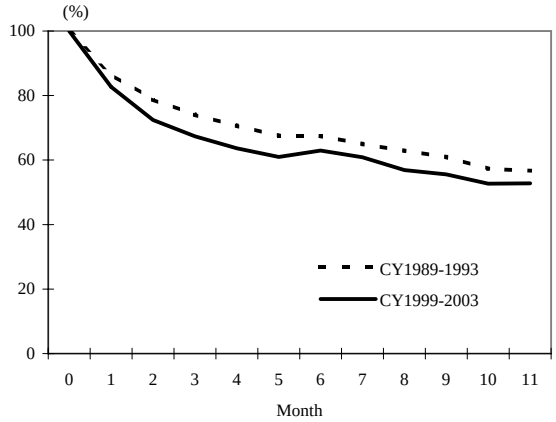
(1) Fresh Food



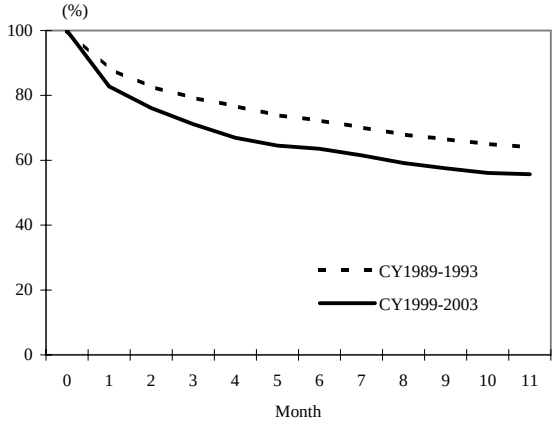
(2) Food Products



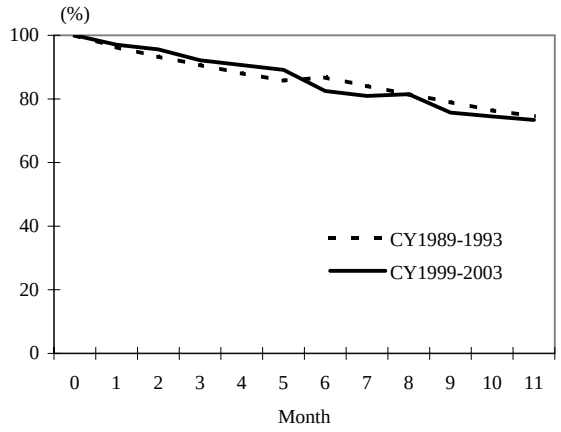
(3) Textiles



(4) Other Industrial Products



(5) Public Services



(6) General Services