

## Heterogeneity of Household Inflation Expectations

### (Summary)

This study analyzed the heterogeneity of household inflation expectations (IEs) and showed that the perfect rational expectations do not hold for household IEs. Under perfect rational expectations, household IEs converge to the same level regardless of various socioeconomic attributes because IEs reflect all of the available information. However, household surveys revealed that IEs vary significantly depending on households' attributes, which contradict perfect rational expectations. IEs vary according to socioeconomic attributes as follows: (1) Men's IEs are generally lower than those of women, (2) the higher the income is, the lower the IEs, (3) the higher the educational level is, the lower the IEs, (4) pensioners and the unemployed showed high IEs, and (5) the relationship between age and IEs is mixed, although in Japan, both are positively correlated. The heterogeneity of IEs has significant implications for central banks' policy communications with the general public. To increase the efficiency of the communication, central banks should target groups with relatively high IEs, including women, low-income groups, those with a low educational background, and, in the case of Japan, older adults.

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## 1. Introduction

The Japanese economy has experienced prolonged periods of low inflation. For example, the consumer price index (CPI), excluding fresh food and the effect of increased consumption tax rates, only shifted between -2 and +2 percent. This trend disappeared suddenly at the beginning of 2021. The CPI's rate of increase soared to +4.1 percent in January 2023 and remained at a relatively high level of +2.7 percent in November 2024.

Although the recent surge in inflation has caused problems in the Japanese economy, it offers new frontiers for analyzing the economy, such as inflation expectations (IEs). Although IEs play a vital role in the macro economy, previous studies have mainly focused on financial markets and professional economists; thus, the formation processes of IEs in households and corporate sectors have not been fully elucidated.

The Infotainment Research Center published three studies on the IEs of Japanese households: “Instability of Japanese households inflation expectations during the current inflationary phase” (published in November 2023), “Japanese households’ inflation perceptions: the formation process and their relationship with the inflation expectations” (published in February 2024), and “Japanese households’ inflation thresholds” (published in September 2024). In June 2024, the center published a study on IEs in the corporate sector, titled “Japanese firms’ inflation expectations during the current inflationary phase.”

As a series of analyses of households’ IEs, this study focused on the heterogeneity of household IEs and showed that fully rational expectations do not hold.

Under perfect rational expectations, which are often assumed in macroeconomic models, people utilize all available information when forming expectations. Therefore, individual IEs converge to the same level regardless of sex, income, educational level, or age. However, household surveys have revealed that IEs vary significantly with attributes and that the same patterns are observed in most advanced economies.

The IEs of households vary according to socioeconomic attributes as follows:

- (1) The IEs of males were generally lower than those of females. This reflects the fact that females are often responsible for daily shopping. Thus, their inflation perceptions, which significantly affect their IEs, are higher than those of males.
- (2) Households with higher income levels had lower IEs. This is related to the fact that higher income groups have higher financial literacy levels.

- (3) Households with higher educational backgrounds had lower IEs. This also reflects that highly educated groups have higher financial literacy levels.
- (4) Pensioners and the unemployed showed higher IEs than those with other employment statuses. This is partly because these groups have fewer opportunities to access information on inflation than other groups.
- (5) There was a mixed relationship between age and IEs, although in Japan, they were positively correlated.

This study also introduces previous studies that showed a negative relationship between IEs and consumer confidence, concerns regarding climate problems, and trust in central banks.

The heterogeneity of IEs has significant implications for central banks' policy communication with the general public. To increase communication efficiency, central banks should target sociodemographic groups with high IEs, including females, those with a low income or low educational background, and older adults (in the case of Japan). Simultaneously, central banks should endeavor to use easy-to-read sentences and avoid technical jargon during communication.

The remainder of this paper is organized as follows. Sections 2–7 show the IEs of different sociodemographic attributes, including sex, educational and income class, employment status, and age classification. Finally, Section 8 presents the conclusions of this study and discusses efficient communication by the central bank with the general public, considering the heterogeneity of household IEs.

## **2. IEs by sex**

The first household attribute that affects IEs is sex. In Japan, as the “Opinion Survey” conducted by the Bank of Japan does not publish any data sorted by sociodemographic attributes, we depended on the “Consumer Confidence Survey” compiled by the Cabinet Office. The survey does not directly inquire regarding respondents' IEs, although it offers nine choices from “lower than minus 10 percent” to “higher than plus 10 percent” and a “don't know” option to provide information on one-year-ahead IEs. This study converted these responses to the quantitative data described in footnote 2<sup>2</sup>.

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<sup>2</sup> The quantitative IEs are weight-averaged assuming following measures: “lower than minus 10 percent”= -10%, “lower than minus 5 percent but above minus 10%”= -7.5%, “lower than minus

The average IEs for the data from April 2013 to August 2024 were 3.6 percent for males and 3.9 percent for females.

Next, in the United States, although the University of Michigan and the Federal Reserve Bank of New York publish households' IEs, only the "Survey of Consumers" conducted by the University of Michigan publishes IEs by sex. The average one-year-ahead IEs from January 1991 to July 2024 were 2.9 percent for males and 3.3 percent for females. The same tendency holds for the five-year-ahead IEs, which were 2.9 percent for males and 3.1 percent for females.

For the Euro area, the "Consumer Expectation Survey" conducted by the European Central Bank is available. As of 2023, one-year-ahead IEs stood at 3.9 percent for males and 4.3 percent for females. In addition, the Deutsche Bundesbank conducts the "Survey on Consumer Expectations," and as of August 2024, one-year-ahead IEs for males were 5.3 percent, while those of female were 5.9 percent.

In the U.K., the "Inflation Attitude Survey" published by the Bank of England is a survey on IEs, and according to the August 2024 survey, the one-year-ahead IEs for males were 2.8 percent, whereas those for females were 3.0 percent.

Table 1 summarizes the IEs according to sex.

(Table 1) IEs by sex (%)

	Japan	U.S.	E.C.B.	U.K.	Germany
Males	3.6	2.9	3.9	2.8	5.3
Females	3.9	3.1	4.3	3.0	5.9

(Note) See the text for data sources and sample periods.

Table 1 indicates that, in every country, the IEs of females were higher than those of males. As analyzed in previous studies published by the Infotainment Research Center,

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2 percent but above minus 5 percent"= -3.5%, "lower than 0 percent but above minus 2 percent"= -1%, "unchanged"= 0%, "higher than 0 percent but less than 2 percent"= 1%, "higher than 2 percent but lower than 5 percent"= 3.5%, "higher than 5 percent but less than 10 percent"= 7.5%, "higher than 10 percent"= 10%.

households' IEs are strongly related to inflation perceptions. Inflation perceptions, in turn, were significantly affected by the prices of frequently purchased goods, such as food and gas, rather than by the movement of macroeconomic indicators, such as the CPI. Previous studies concluded that although sex differences in IEs were clearly observed in households in which females were mainly responsible for the daily shopping, the sex differences vanished for households in which the male participants were mainly responsible for such tasks<sup>3</sup>. The results of these past studies imply that the sex gap originated not from fundamental differences between the sexes but from price information obtained through daily shopping.

Please refer to “Japanese Households’ Inflation Perceptions: The Formation Process and the Relationship with the Inflation Expectations” published by the Infotainment Research Center for details of the relationship between the inflation perceptions and IEs.

### **3. IEs by income classification**

Next, we turn to IEs by income classification.

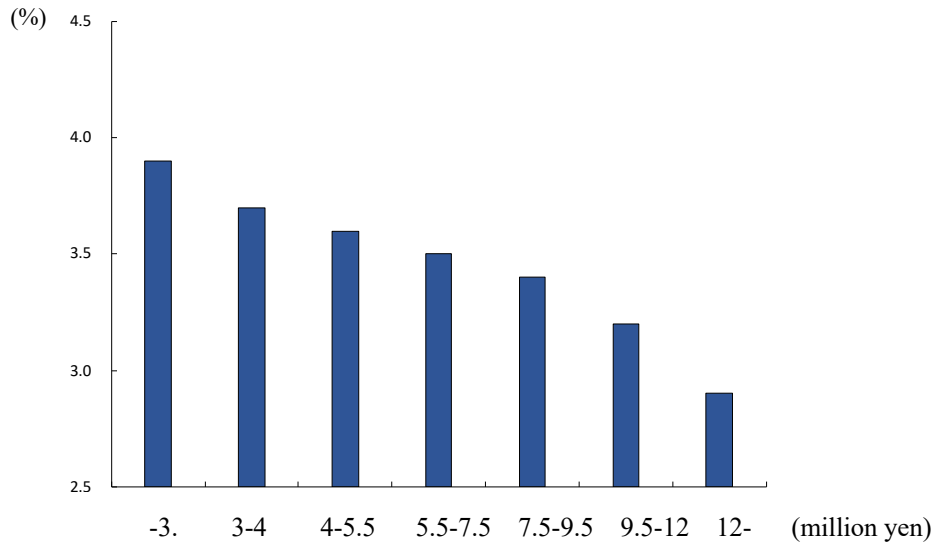
In the case of Japan, the “Consumer Confidence Survey” showed that the high-income classes had low IEs (Figure 1). Specifically, the IEs of households with an annual income of less than 3 million yen (approximately 20 thousand USD) were 3.9 percent, whereas those of households with an annual income of more than 12 million yen (approximately 80 thousand USD) were 2.9 percent—1 percentage point less than the lowest income class.

For U.S. households, surveys conducted by both the University of Michigan and the Federal Reserve Bank of New York are available. Although the number of income classifications is limited to three, both surveys show that the higher the income level is, the lower the IEs, which is the same pattern seen in Japan. For the NY Fed, a significant gap was observed between the lowest and highest classes.

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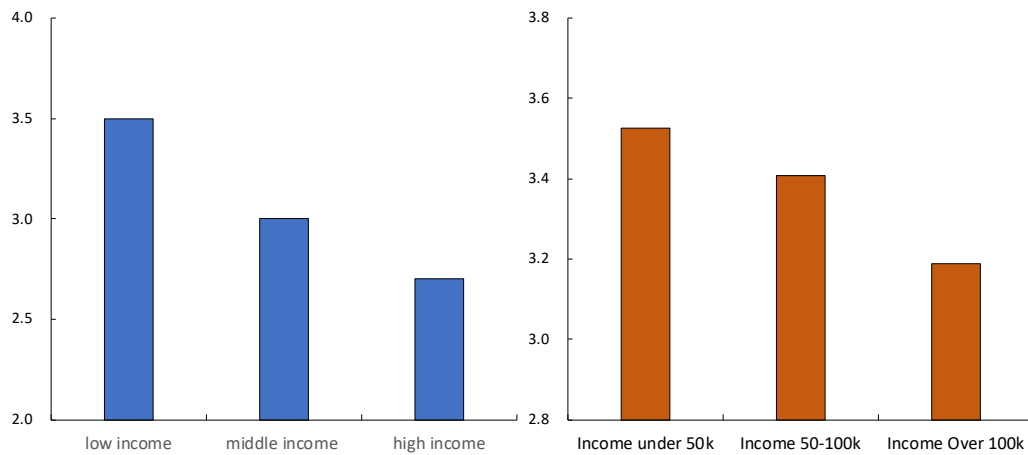
<sup>3</sup> Dacono et al. (2021a, 2021b).

(Figure 1) Japanese households' IEs by income classification (%)



(Source) Cabinet Office "Consumer Confidence Survey" data from April 2013 to August 2024.

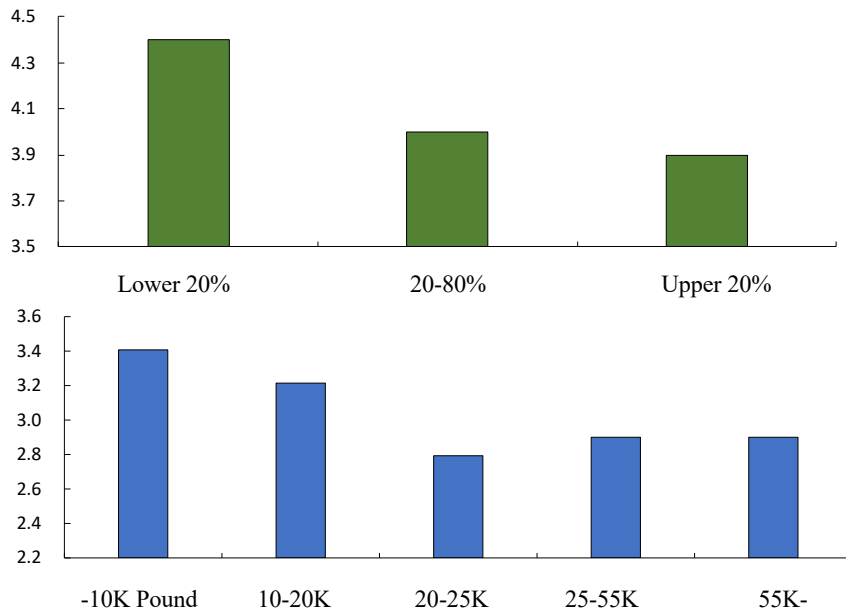
(Figure 2) U.S. households' IEs by income classification (%)



(Source) University of Michigan (left diagram) and the Federal Reserve Bank of New York (right diagram). The sample period is from January 1991 to July 2024 for the left diagram and from June 2013 to August 2024 for the right diagram.

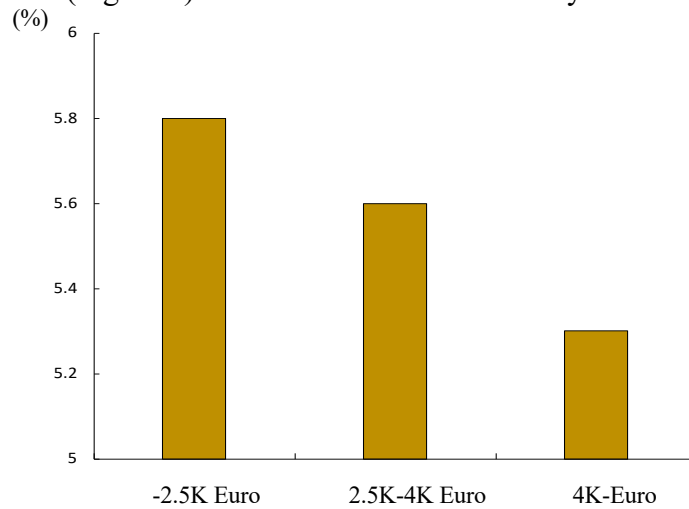
Regarding Europe, data for the Euro area, the U.K., and Germany all showed that higher income classes are associated with lower IEs (Figures 3 and 4). In particular, in the case of the Euro area, the IEs of the lowest income class were significantly higher than those of the other classes.

(Figure 3) IEs of Euro area (upper graph) and U.K. (lower graph) households by income class (%)



(Source) ECB (upper graph) and BOE (lower graph). Sample period: 2023 CY (upper diagram) and August 2024 (lower diagram)

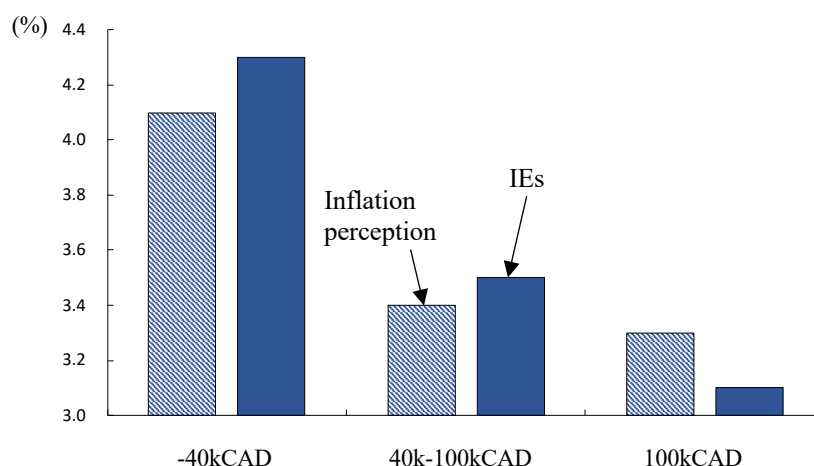
(Figure 4) IEs of German households by income class



(Source) Deutsch Bundesbank, sample period: April 2020 to August 2024.

The Bank of Canada surveyed inflation perceptions in addition to IEs for three income classes (Figure 5). The figure shows that inflation perceptions also tend to be negatively correlated with income level.

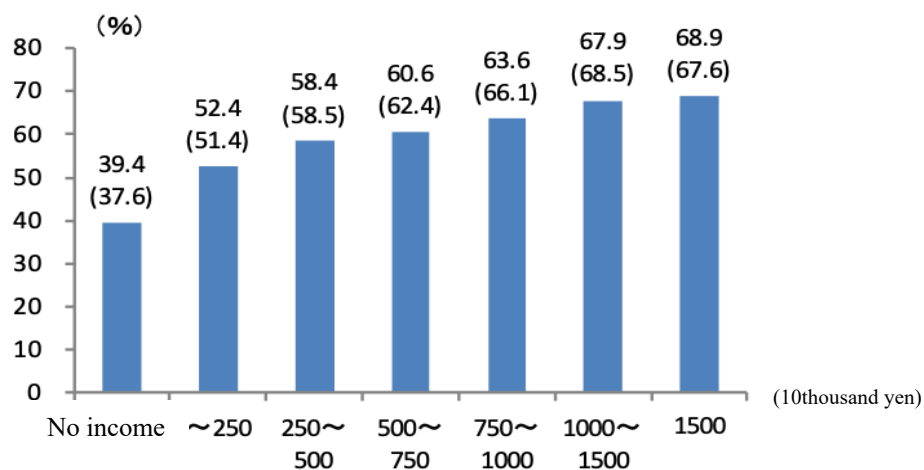
(Figure 5) IEs and inflation perception of Canadian households by income class



(Source) Bank of Canada “Canadian Survey of Consumer Expectations.” Sample period: 2014/4Q-2024/2Q.

The observed correlations between IEs and income classes seem to be mediated by households’ financial literacy. For example, a Japanese financial literacy survey conducted by the Central Council for Financial Service Information (CCFSI (2022)) indicated that the higher the income class is, the higher the financial literacy (Figure 6). This role of financial literacy in determining IEs is observed not only in Japan but also in other developed countries, as shown in the next section.

(Figure 6) Income level and financial literacy of Japanese households



(Source) CCFSI (2022), page 12. The survey was conducted in 2022. The Y-axis indicates the test results regarding financial literacy problems. Figures in parentheses indicate the test results of the 2019 survey.

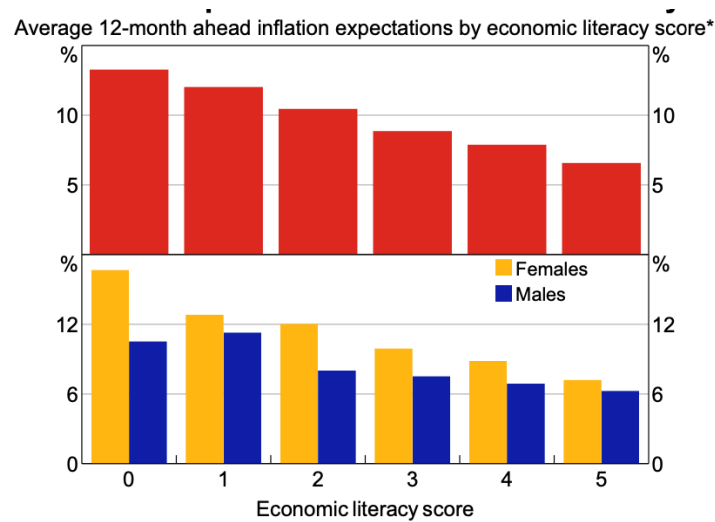


#### 4. IEs by financial literacy and educational background

The last section assumed that “higher the financial literacy is, the lower the IEs.” To the best of our knowledge, the only evidence of such a relationship was found in Australia (Figure 7). Figure 7 clearly indicates a negative relationship between economic literacy and household IEs.

Several surveys on IEs have examined the relationship between numeracy, which is related to financial literacy, and IEs (Figure 8). The results were mixed: a Canadian survey showed a clear negative relationship between the two variables, while a U.S. survey did not show such a relationship. While these survey results might have been affected by technical factors, such as differences in measurement methods, further analysis is required.

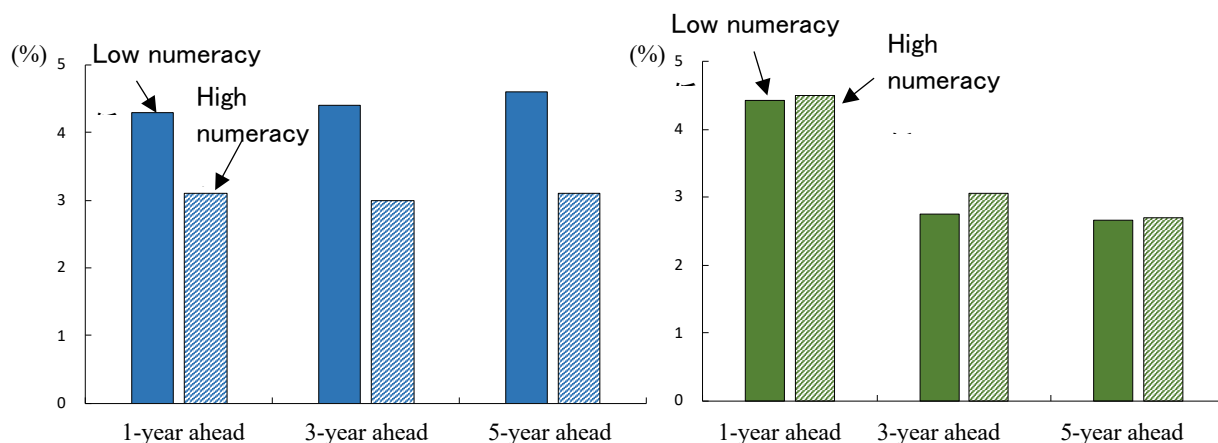
(Figure 7) IEs and economic literacy in Australia



\* Excludes responses below -10% or above 50%.  
Source: RBA.

(Source) Reserve Bank of Australia (2024), page 24. The Y-axis shows IEs, and the X-axis indicates scores on an economic literacy test. The lower graph shows the breakdown by sex.

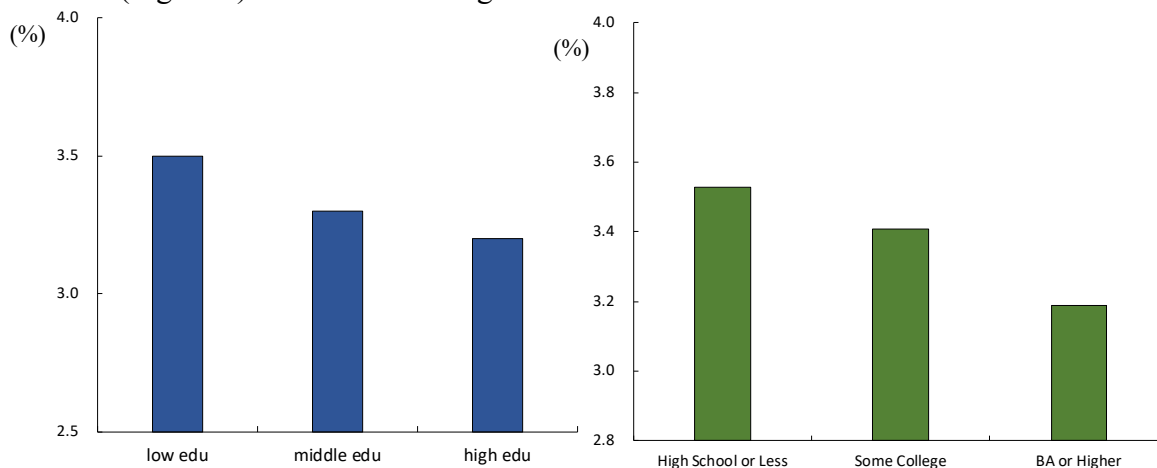
(Figure 8) Numeracy and IEs in Canada (left) and the U.S. (right)



(Source) Left figure: “Canadian Survey of Consumer Expectations” conducted by the Bank of Canada. Right figure: “Survey of Consumer Expectations” conducted by the Federal Reserve Bank of New York. Sample period for the left figure: 2014/4Q-2024/2Q; sample period for the right figure: June 2013 to August 2024.

The surveys also asked about the respondents’ educational backgrounds. In the U.S., data are available from surveys conducted by the University of Michigan and the Federal Reserve Bank of New York. They clearly indicated that a higher educational background was associated with lower IEs (Figure 9).

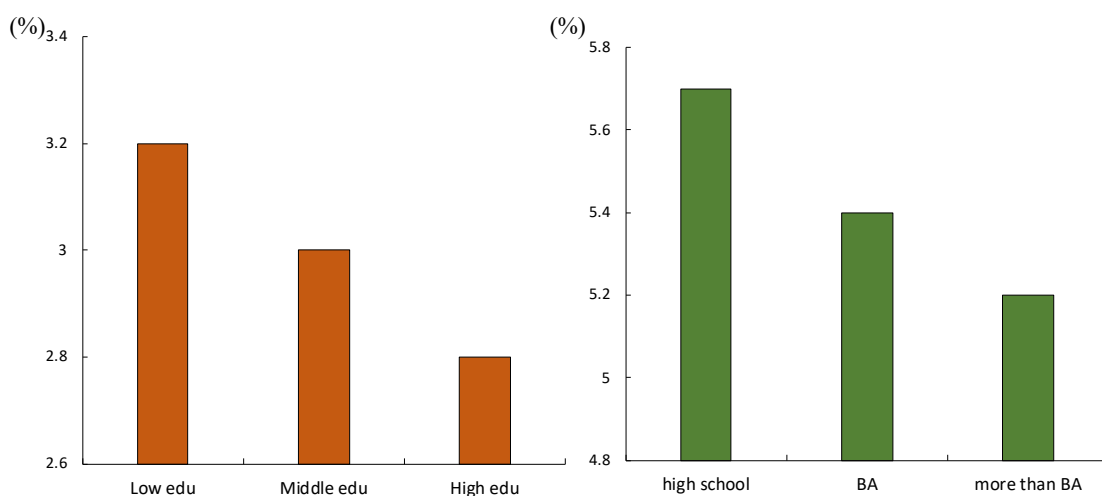
(Figure 9) Educational background and IEs in the U.S.



(Source) Left: University of Michigan. Right: Federal Reserve Bank of New York. The sample period is January 1991-July 2024 for the left diagram and June 2013-August 2024 for the right diagram.

Surveys conducted by central banks in Europe, such as the U.K. and Germany, also indicated that a higher educational background is associated with lower IEs (Figure 10).

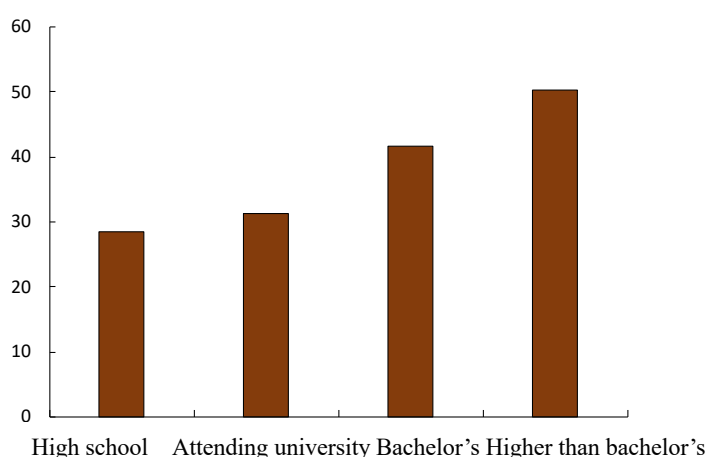
(Figure 10) Educational background and IEs in the U.K. (left) and Germany (right)



(Source) Left: Bank of England. Right: Deutsche Bundesbank. The sample period for the left figure is August 2024, and that for the right is June 2022-August 2024.

The correlations observed between educational background and IEs seem to be mediated by the level of financial literacy, the same mechanism as that seen in the relationship between income class and IEs. A Japanese field study showed a positive relationship between educational background and financial literacy (Figure 11), which implies that the level of financial literacy is the key to determining IEs.

(Figure 11) Educational background and financial literacy in Japan



(Source) Sticha and Sekita (2023). Financial literacy on the Y-axis is the score on three basic questions regarding financial literacy (inflation, interest rates, and risk diversifications).

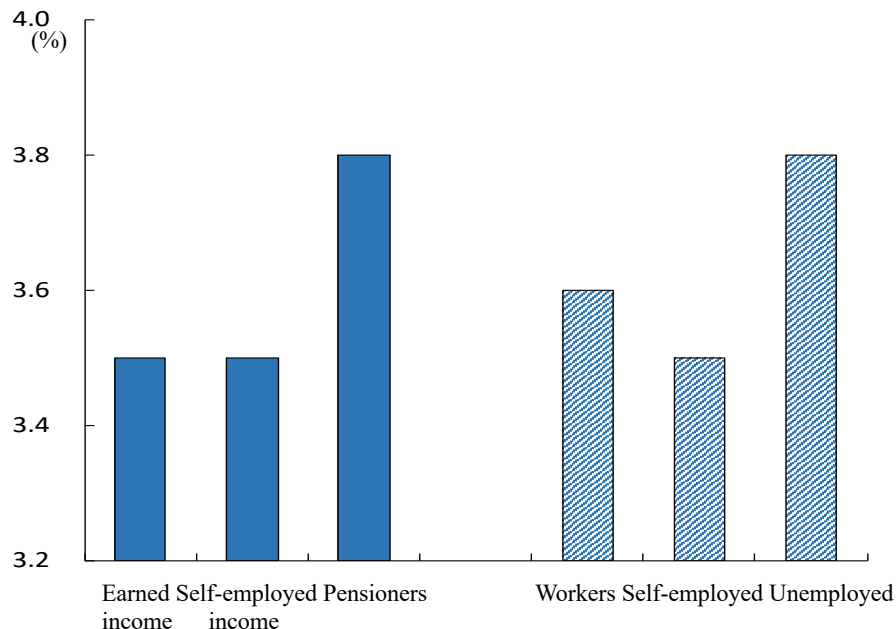
## 5. IEs by employment status

This section examines households' IEs based on employment status. In Japan, the "Consumer Confidence Survey" provides two types of IEs based on employment status. One is by income type (earned income, self-employed income, and pension income), and the other is by household type (head of household: workers, self-employed, and unemployed) (Figure 12).

Regarding income type, the IEs of pensioners were higher than those of workers and self-employed individuals. This may reflect the fact that the average age of pensioners is higher than that of workers and self-employed individuals. The relationship between age and IEs is discussed in the following section.

Regarding household type, the IEs of unemployed households were higher than those of working and self-employed households. This might be partly due to the fact that the workers and self-employed individuals may have more chances to acquire information regarding daily price movements and macroeconomic conditions than the households of the unemployed.

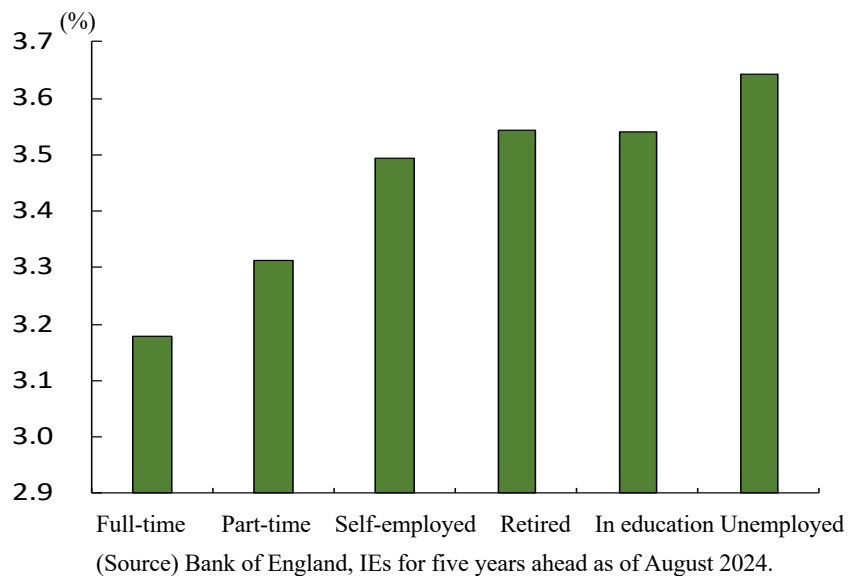
(Figure 12) Income type (left), household type (right), and IEs in Japan



(Source) "Consumer Confidence Survey," Japanese Cabinet Office

In addition to Japan, the Bank of England publishes IEs by employment status (Figure 13). The IEs of full-time workers were the lowest, followed by those of part-time workers, self-employed workers, retired workers, in education individuals, and unemployed workers. As in the case of Japan, the IEs of the unemployed were the highest among the various employment statuses. Such differences in IEs by employment status seemed to be affected by how attentive households were to daily price movements and macroeconomic conditions.

(Figure 13) Employed-status and IEs in the U.K.

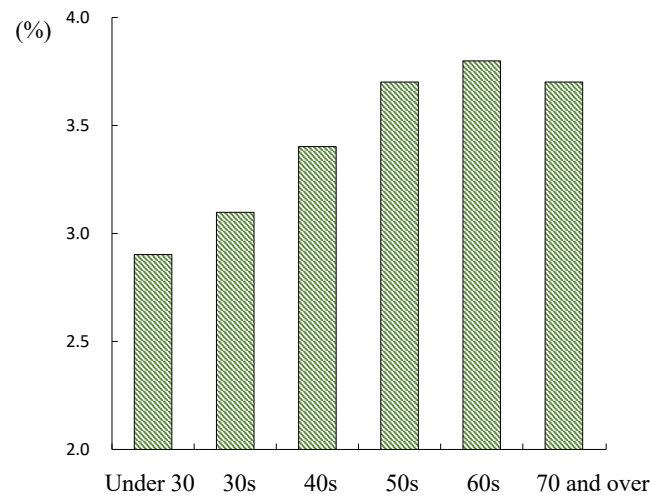


## 6. IEs by age classification

Finally, this section examines the relationship between IEs and age. In the case of Japan, the IEs of the youngest class were the lowest among the age classifications and rose as the heads of households became older until the 60s (Figure 14).

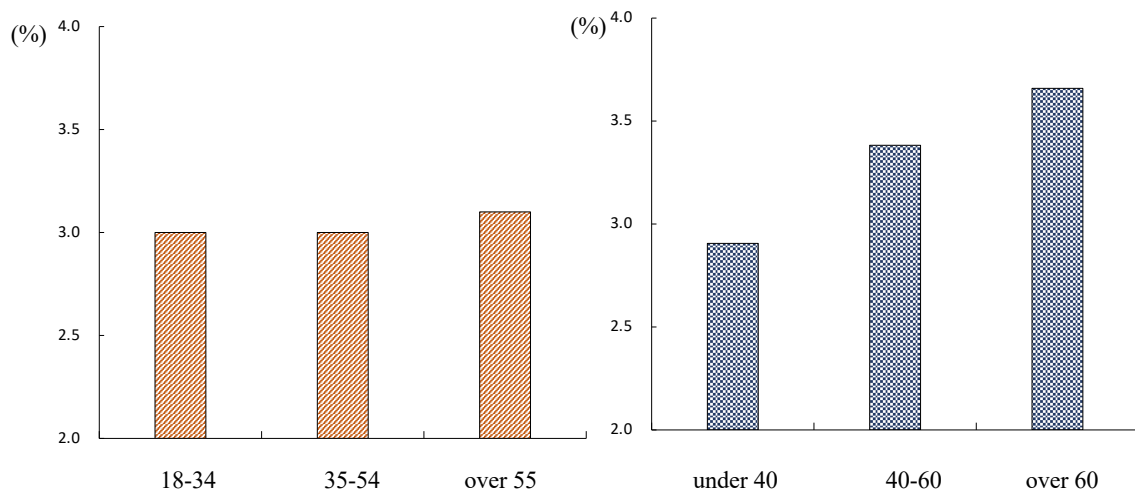
In the U.S., the distribution patterns of IEs differ by surveyor (Figure 15). The survey conducted by the University of Michigan showed IEs around 3 percent, irrespective of age classification. Although the age classifications differ from those of the University of Michigan, a survey conducted by the Federal Reserve Bank of New York showed a positive relationship between age and IEs, similar to the case of Japan.

(Figure 14) IEs by age classification in Japan



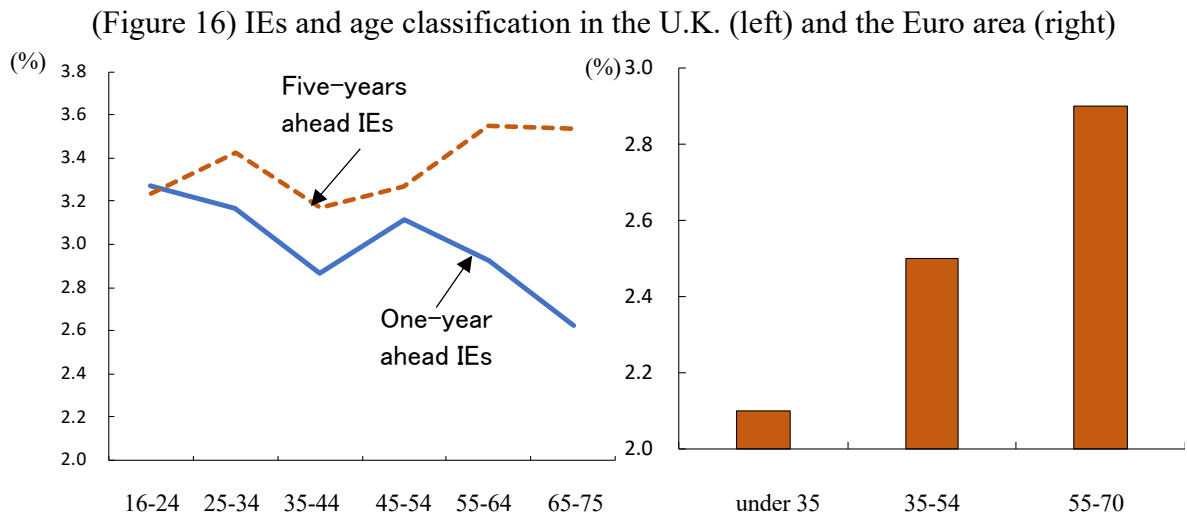
(Source) “Consumer Confidence Survey,” Japanese Cabinet Office. The sample period is April 2013-August 2024.

(Figure 15) IEs and age classification in the U.S.



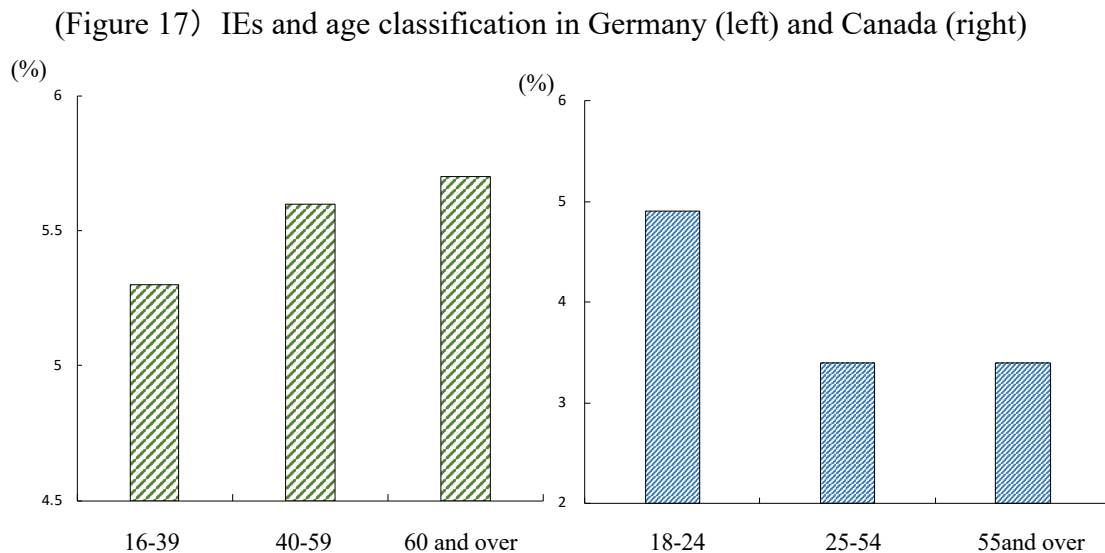
(Source) Left: University of Michigan. Right: Federal Reserve Bank of New York. The sample period for the left is January 1991-July 2024, and that for the right is June 2013-August 2024.

In the case of Europe, the U.K. survey for one-year-ahead IEs showed a downward slope, while those five years ahead were almost flat (Figure 16). The Euro area, shown on the right side of Figure 16, has a positive relationship between age and IEs, the same pattern observed in Japan and the Federal Reserve Bank of New York survey.



(Source) Left: Bank of England. Right: European Central Bank. The sample period is August 2024 for both figures.

Figure 17 shows the cases of Germany and Canada. Germany showed a positive relationship between age and IEs, while in Canada, the IEs of individuals aged 18-24 years were significantly higher than those of the older generations.



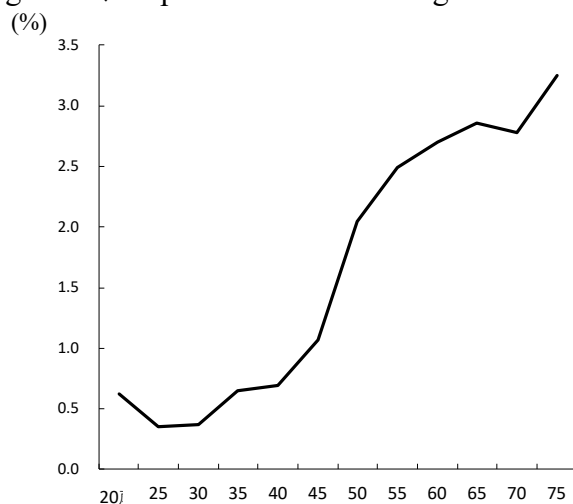
(Source) Left: Deutsche Bundesbank. Right: Bank of Canada. The sample periods are April 2019-August 2024 for the left figure and 2014/1Q-2024/2Q for the right figure.

Although the relationship between age and IEs has been widely surveyed in advanced economies, the survey results are mixed, unlike for other sociodemographic attributes.

One theory explaining the relationship between age and IEs is that IEs are affected by past high inflation experiences. Typical examples are hyperinflation in Germany in the 1920s, an extremely high inflation rate in Japan after World War II, and the two-digit inflation rates observed in the 1970s in Japan and the U.S. The IEs of those who experienced such high-inflation periods are known to be higher than those of generations who never experienced such conditions. Figure 18 shows the average lifetime inflation rates for the Japanese population according to age classification. Because the older generations have experienced high inflation periods, their average inflation rates are higher than those of the younger generations, who mainly grew up in the deflationary period. This explanation is consistent with that shown in Figure 14, which demonstrates a positive relationship between age and IEs.

However, past inflation experiences alone cannot explain the relationship between IEs and age as the University of Michigan survey showed almost no correlations and the U.K. and Canada surveys indicated reverse correlations.

(Figure 18) Japanese lifetime average inflation rates by age



(Source) “Consumer Price Index” Japanese Cabinet Office. Average inflation rates are calculated based on the annual increasing rate of the CPI by comparing the CPI index of the birth year and that of 2024. Although ideally, increasing CPI rates of the distant past should be discounted, this figure showed simple average inflation rates.

Another approach to explain the relationship between age and IEs is to focus on the life-cycle effects of households, such as changes in the number of children and household members and the occupational conditions of each household member. If such life-cycle effects are the dominant factors in determining the relationship between age and IEs, most



countries should show similar age-IEs patterns. However, this is not the case as discussed above.

Multiple factors appear to affect the relationship between age and IEs; thus, further analysis is required in this category.

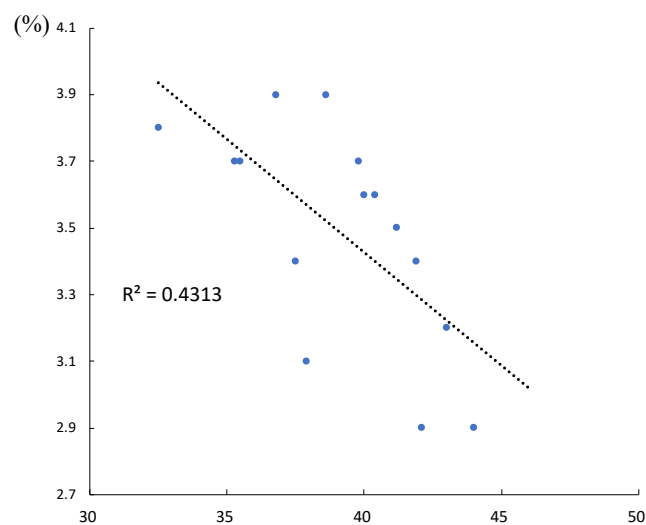
## 7. Other factors affecting IEs

Household surveys and past academic papers have studied other factors affecting IEs.

First, some household surveys explored households' consumer confidence in addition to IEs.

Using the Japanese survey, IEs and the consumer confidence index (consumer sentiments for future living conditions, in which higher values indicate better conditions) were plotted for various socioeconomic attributes such as sex, age, and income level (Figure 19). The figure indicates that the higher the confidence index, the lower are the IEs.

(Figure 19) IEs and consumer confidence in Japan

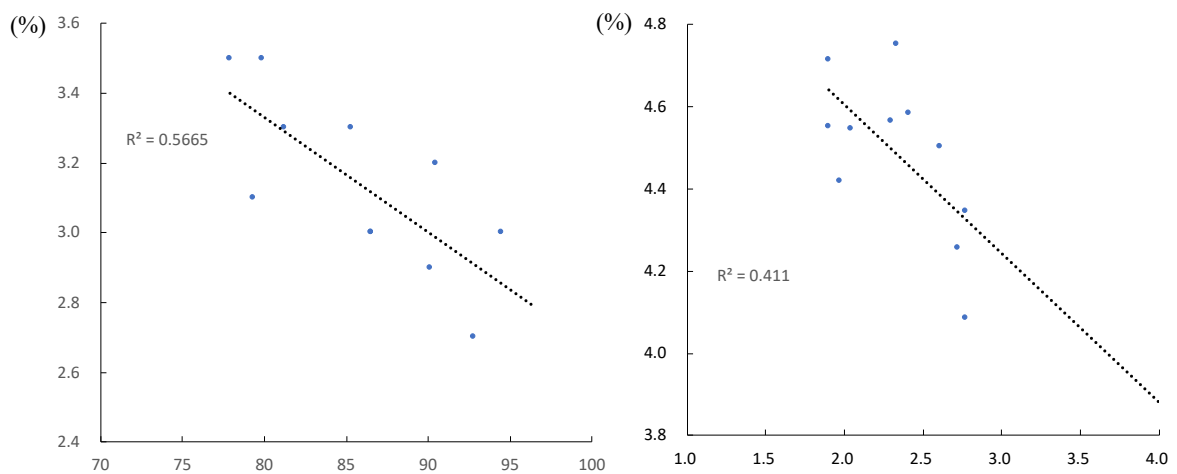


(Source) “Consumer Confidence Index” by the Japanese Cabinet Office. The X-axis indicates the consumer confidence index, and the Y-axis indicates IEs. The sample period is April 2013-August 2024.

Similarly, in case of the U.S., the data showed that the higher the satisfaction with living conditions was, the lower the IEs, both in the University of Michigan survey (consumer sentiment) or in the Federal Reserve Bank of New York survey (earnings growth expectations) (Figure 20).

Such a negative relationship between the IEs and consumer sentiment seems to be affected by households' income conditions. In the Japanese survey, the consumer confidence index was positively related to income and negatively related to age classification, and the IEs of males were higher than those of females. Similarly, the University of Michigan survey showed that consumer sentiment was positively correlated with income and educational level, negatively correlated with age classification, and higher for males than females.

(Figure20) IEs and consumer sentiment in the U.S.



(Source) Left: University of Michigan. Right: Federal Reserve Bank of New York. The sample periods are January 1991-August 2024 for the left and June 2013-August 2024 for the right.

In addition, some academic studies have researched other factors that affect households' IEs. For example, Brouwer and Haan (2022) studied the relationship between IEs and trust in the central bank, in this case, the European Central Bank (ECB). This study showed that the higher the trust is, the lower the IEs. The lowest IEs were close to 2%, which is consistent with the inflation target of the ECB.

A survey by Meinerding et al. (2022) examined the relationship between IEs and the degree of concern about climate problems in German households. They found that the higher the concern was, the lower the IEs. They also found that households deeply concerned about climate problems had relatively high levels of trust in public institutions, including the ECB. Such tendencies push down IEs, as shown by Brouwer and Haan (2022).

## **8. Conclusion: Implications of the heterogeneity of household IEs for central banks' communication with the general public**

This study shows that households' IEs are heterogeneous; thus, perfect rational expectations do not hold for the IEs of households.

Under perfect rational expectations, which are often assumed in macroeconomic models, people utilize all available information when forming expectations. Therefore, individual IEs converge to the same level regardless of sex, income, educational level, and age. However, the various household surveys discussed above revealed that heterogeneous IEs were observed in most advanced economies. In addition, past studies conducted by the Infotainment Research Center obtained the same results.

The heterogeneity of households' IEs discussed above can be summarized as follows:

- (1) The IEs of males were generally lower than those of females. This reflects the fact that females are often responsible for the daily shopping. Thus, their inflation perceptions, which significantly affect their IEs, are higher than those of males.
- (2) Households with higher income levels had lower IEs. This is related to the fact that higher income groups have higher financial literacy levels.
- (3) Households with higher educational backgrounds had lower IEs. This finding also reflects that highly educated groups have higher financial literacy levels.
- (4) Pensioners and the unemployed showed higher IEs than those with other employment statuses. This is partly because these groups have fewer opportunities to access information related to inflation than other groups.
- (5) There was a mixed relationship between age and IEs, although in Japan, they were positively correlated.

This study also introduced a previous study showing a negative relationship between IEs and consumer confidence, concern about climate problems, and trust in central banks.

The heterogeneity of IEs has significant implications for central banks' policy communication with the general public. To increase communication efficiency, central banks should target sociodemographic groups with high IEs, including females, those with low income or educational background, and older adults (in the case of Japan). At the same time, central banks should endeavor to use easy-to-read sentences and avoid technical jargon during communication. According to the survey by the Bank of Japan, over half of respondents answered that the bank's communication is "unclear" because it

is “too technical and difficult.” However, these issues are not confined to making the communication easier to understand. Fundamentally, effectively reaching targeted households for communication purposes is difficult for central banks.

Central banks rely heavily on TVs and newspapers for policy communication. Although many central banks are testing new media, such as social network systems, to reach households directly, they are still far from successful. Central banks should continue to endeavor to identify efficient tools to reach targeted audiences.

It is comforting to know that the results of randomized control tests (RCTs) have proven that once households are informed about policy communications such as current inflation rates, monetary policy frameworks, and inflation targets, they reduce their IEs. The RCTs also warned central bankers that such an effect lasts only a maximum of six months; thus, repetitive communications are required.

The difficulties in central bank communications arise not only from providers of information but also from receivers of information. As a previous study conducted by the Infotainment Research Center indicated, under low and stable inflation conditions, households’ attention to inflation is very limited. Only after the inflation rates begin to soar do they start actively gathering information on inflation. Such households’ behavior is often called “rational inattention” and could prove to be a significant obstacle to central banks’ communication with the general public. The latest Bank of Japan’s survey revealed that 74% of respondents chose “don’t know” in relation to the bank’s 2% inflation target. Similarly, 68% answered that they were “not interested” in the bank’s activities. Providing information to households with no interest in monetary policy is difficult. In addition, it requires substantial effort to increase households’ level of attention to inflation as they are “rationally” inattentive to policy communication when the inflation rates are low and stable.

The above discussion shows that various issues need to be solved before the central bank communicates with the general public successfully. Taking communication problems seriously, some even argue that central banks should concentrate on communicating with professionals. However, central banks changed their communication style in the 1990s, which was not long ago considering the long history of central banks. Furthermore, policy communications thus far have mainly focused on financial market participants and professional economists. Only after the global financial crisis did central banks realize the necessity of communicating with the general public. Therefore, the communication experience and related data necessary to conduct efficient communication

are still lacking, especially for corporate sectors, the task of which is to price goods and services.

Therefore, the most urgent task for encouraging central banks' communication with the general public is to accumulate survey data and conduct various RCTs to analyze their behavior. During these processes, it should be noted that IEs are key variables for policy communication. This is due to the fact that (1) the household sector is the largest purchaser of goods and services and is deeply related to wage negotiations and that (2) firms are price-setters and thus have a significant influence on inflation development.

The Infotainment Research Center will continue its efforts to research effective central bank communications by focusing on the IEs of the general public.

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