Infotainment Research Center

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Japanese Firms' Inflation Expectations during the Current Inflationary Phase

This study analyzed Japanese firms' inflation expectations (IEs) and their formation mechanism during the current inflationary phase.

First, analyzing Tankan data revealed that Japanese firms' IEs moved around 1 percent before the pandemic. This rose to 3 percent for one-year-ahead and about 2 percent for five-year-ahead expectations during the current inflationary period. Larger firms showed lower IEs than smaller ones. Furthermore, firms' IEs lie between those of households and professionals.

Second, firms' IE formation mechanism is neither perfectly rational nor adaptive. Firms are irrational due to (1) the wide dispersion of IEs reflecting the size of firms and (2) upward bias against actual CPI. Simultaneously, firms show rational behaviors, such as assigning higher priority to monitoring IEs, when actual inflation soars. Rational inattention (RI) theory became a useful framework for explaining such seemingly inconsistent firms' behaviors. RI assumes that firms intentionally and rationally ignore the information which have relatively small value for the their activities.

Third, Japanese firms' IEs are not anchored at the 2 percent inflation target. Even the longer-term IEs, such as three- and five-year-ahead ones, have clearly increased during the current inflationary phase. Similar patterns are observed in the U.K., Italy, and other major developed countries.

Since data and studies on firms' IEs are limited, further research challenges include accumulating related data and analyzing the formation mechanism of IEs.

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1. Introduction

The Japanese economy suffered from a prolonged period of low inflation. For example, the consumer price index (CPI), excluding fresh food and the effect of increased consumption tax rates, moved between -2 and +2 percent. This trend suddenly diverged at the beginning of 2021. For instance, the rate of increase of CPI soared to +4.1 percent in January 2023 and remained at a relatively high level of +2.6 percent in March 2024.

Although the recent surge in inflation has caused various problems in the Japanese economy, it has also offered new frontiers for analyzing Japan's economy, such as breaking the persistent deflationary trend in the pre-pandemic period.

The Infotainment Research Center published two studies on the inflation expectations (IEs) of Japanese households: "Instability of Japanese households inflation expectations during the current inflationary phase" (published in November 2023) and "Japanese households' inflation perceptions: the formation process and their relationship with the inflation expectation" (published in February 2024). These studies pointed out that: (1) Japanese households' short-term IEs significantly exceeded the rate of increase of the CPI during the current inflationary phase; and (2) longer-term IEs also soared compared to those of U.S. and European households.

This study also focuses on IEs, albeit on those of the corporate sector. The main results are summarized as follows:

First, based on Tankan data, Japanese firms' IEs moved around 1 percent before the pandemic. This rose to 3 percent for one-year-ahead and about 2 percent for five-year-ahead expectations during the current inflationary period. Although larger firms showed lower IEs than smaller firms, no distinct differences were observed between the types of industries. Data on different economic sectors provided supporting evidence for the relationship "IEs of economist and financial market participants < IEs of firms < IEs of households." About the half of the firms answered "don't know" about five-year-ahead IEs due to economic uncertainty; this share increased by additional 5 to 10 percentage points after the pandemic.

Second, firms' IE mechanisms do not completely follow either rational or adaptive expectations. Rational expectations do not hold because of: (1) a wide dispersion of IEs

by firm size, (2) a clear upward bias of IEs compared to the CPI, and (3) observed correlations between firms' expected output prices and IEs. In addition, pure adaptive expectations are not supported because: (1) firms assign higher priority to IEs when actual inflation soars, and (2) IEs are affected by the movement in input costs.

"Rational inattention" (RI) theory became a useful framework for explaining such seemingly inconsistent firms' behaviors. RI assumes that firms intentionally and rationally ignore information that has relatively small value for their activities. According to the RI theory, firms assign a higher priority to IEs in business operations when inflation rates or input costs rise significantly, whereas firms assign a lower priority to IEs if deflationary conditions last for a significant period.

Third, IEs are not anchored at the 2 percent inflation target (a state of IE moving stably around the central bank's inflation target). Even longer-term IEs, such as three- and five-year-ahead IEs, have clearly risen during the current inflationary phase. Similar patterns are observed in the U.K., Italy, and other major developed countries.

Data and previous studies on this subject in and outside Japan are limited compared to those on household sectors, economists, and financial markets. Therefore, further research challenges include accumulating related data and analyzing the formation mechanisms of IEs.

The remainder of this article is organized as follows. Section 2 summarizes the increased attention towards firms' IE. Section 3 uses Tankan data to analyze firms' IEs. Section 4 discusses the IE formation mechanism and whether firms' IEs are anchored around the inflation target. Finally, section 5 presents the conclusions of the study.

2. The purpose of analyzing firms' IEs

2.1. Increased attention towards firms' IEs

As mentioned in Section 1, studies on firms' IEs in and outside Japan are limited. This is mainly due to the following two reasons.

First, data on firms' IEs are limited.[2] Existing problems in gathering data on firms'

[2] Bank of Japan (2016, 2019), Bouche et al. (2021), Bryan et al. (2015), Coibion et al. (2015), Garchiga et al. (2023), and Richards and Verstraete (2016).

IEs are difficulties in (1) increasing the sample size due to firms' reluctance to participate, (2) making samples representative of the population in terms of type of industry and size of firms due to sample size limitations, and (3) unifying respondents' job positions.

Second, academics have focused their attention on the IEs of financial market participants and professional economists. This is because they seem to be better informed about the development of future inflation than ordinary people. Some studies assumed that every participant had perfect rational expectations and used the IEs of professional economists, even when analyzing the IEs of households and firms. However, in reality, as businesspersons have valuable information on their firms' input and output prices, they have their own perspectives on future inflation which are different from those of professional economists.

The tendency to ignore firms' IEs began to change in the 2010s supported by the following reasons. First, major economic theories began to explicitly treat firms' price-setting behaviors in their models. Second, firms' unique price-setting behaviors attracted economists' attention when analyzing deflationary economies during the pre-pandemic period. Third, during the current inflationary period, when most developed countries had marked dual-digit inflation rates, economists were curious about how the surge in CPI would affect various types of IEs, including households, firms, and financial market participants. Moreover, central bank economists, in addition to academics and professional economists, began paying attention to firms' IEs, since the movements of IEs are one of the important factors in determining the effects of monetary tightening policy under high inflation.

Reflecting such movements, since 2010s, central banks in major developed countries began surveying firms' IEs (Table 1). The Bank of Japan added questionnaires on firms' IEs as part of the Tankan survey that began in March 2014. This effort was ahead of most major developed countries central banks, which started their surveys in the late 2010s or during 2020s.

2.2. The relationship between firms' IEs and the macroeconomy

Before proceeding to the data analysis, this section discusses how firms' IEs affect the macro economy.

First, firms' IEs affect the price-setting behaviors of products and services. Final output prices are also affected by the demand and supply conditions in the market. However, as the current inflationary phase shows, firms' price-setting behaviors played a

larger role than usual due to the cost-push inflation caused by price surges in raw materials, depreciating yen, and weakening global supply chains under the influence of the U.S.–China trade conflict.

(Table 1) Surveys of firms' IEs in major developed countries

Country	Name and surveyors	Beginning year	Number of surveyed firms
Japan	Tankan Survey (Bank of Japan)	2014	About 11,000
U.S.	Survey of firms' inflation expectations (Federal Reserve Bank (FRB) of Cleveland)	2017	300～600
U.S.	Business inflation expectations survey (FRB of Atlanta)	2011	About 300
U.K.	Monthly decision makers' panel (Bank of England)	2022	N.A.
France	Inflation expectations (Bank of France)	2021	N.A.
Italy	Survey on inflation and growth expectations (Bank of Italy)	1999	About 1,000
Norway	Expectation survey for Norges Bank (Norges Bank)	2002	N.A.
Canada	Indicators of capacity and inflation pressures for Canada (Bank of Canada)	2011	About 400

(Source) Compiled by author. Part of the data on the number of surveyed firms were from Bouche et al. (2021).

Second, IEs significantly affect wage-setting behaviors. A typical case was the U.S. economy in the 1970s, when surging inflation increased IEs and caused an upward wage-price spiral. Once the economy falls into such a condition, containing inflation requires a prolonged tight monetary policy and enduring high unemployment rates, thereby significantly damaging the economy.

Third, firms' IEs influence real interest rates. Even if the nominal interest rates are constant, the real interest rates for individual firms are affected by their IEs. Because real

interest rates are an important factor in deciding fixed investments, they in turn affect the business cycle.

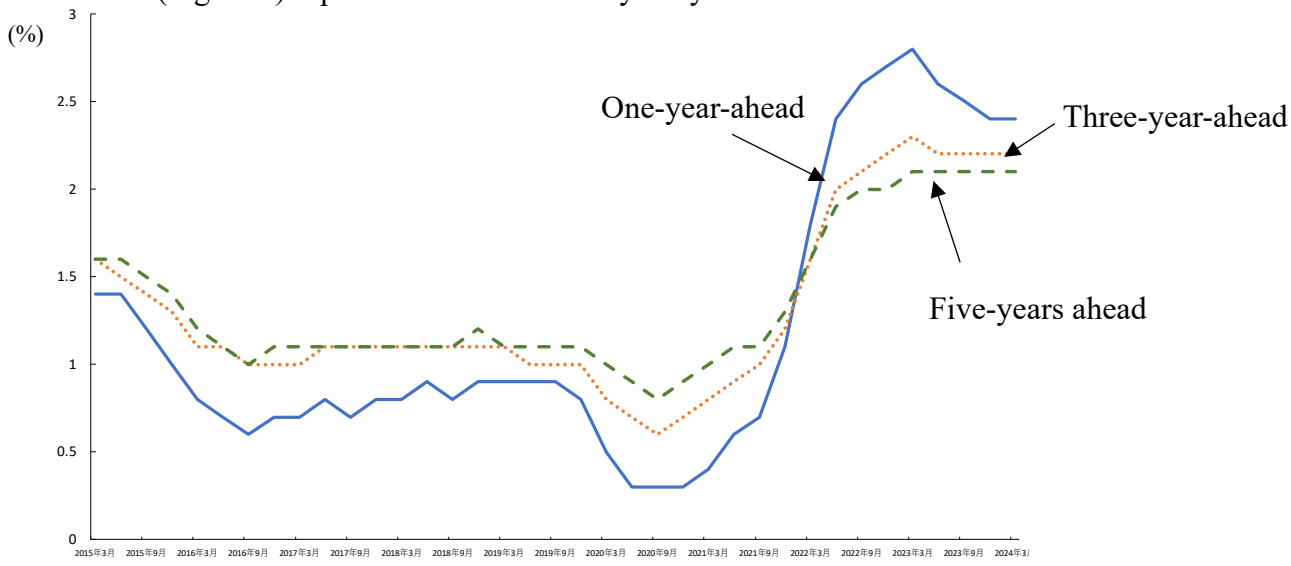
Fourth, IEs affect monetary policy efficiency. Firms' IEs are anchored when their long-term IEs move close to the inflation target and are not significantly affected by changes in the actual inflation rate. If this holds, an upward wage-price spiral is unlikely to occur and high inflation rates will swiftly converge to the inflation target (whether Japanese firms' IEs are anchored is discussed in Section 4.4).[3]

3. Detailed analysis of firms' IEs

3.1. Japanese firms' IEs

This section analyzes firms' IEs using Tankan data. Tankan is the only quarterly survey conducted in Japan on firms' IEs. The Bank of Japan conducts the survey, covering more than 10,000 firms located in Japan. The survey askes firms about Diffusion Index (D.I.), such as business conditions, and supply and demand conditions, as well as figures for sales and current profits. It is considered important survey data in Japan to judge business conditions. In 2014, questions about expected inflation (one-, three-, and five-years ahead) and output prices (one-, three-, and five-years ahead) (Figures 1 and 2) were added.

(Figure 1) Japanese firms' IEs surveyed by Tankan



(Source) Bank of Japan. Data indicated include firms with all-industries and all-size.

[3] Bank of Japan (2018).

Japanese firms' IEs moved stably at approximately 1 percent for every term during the pre-pandemic period (see Figure 2). They remained positive even when the CPI fell into negative territory in 2020. Since 2021, IEs began surging and peaked at 3 percent for one-year-ahead IEs and approximately 2 percent for five-year-ahead IEs. One-year-ahead IEs continued to decline moderately after March 2023, whereas five-year-ahead IEs remained around the peak level. Meanwhile, the three-year-ahead IEs moved closer to the five-year-ahead IEs.

3.2. Relationship between IEs and output prices

In addition to general prices, Tankan asks about firms' outprice expectations (Figure 2). The one-year-ahead expectations in both figures exhibit similar trends. Expected output prices fell into negative territory in 2020, similar to the CPI, whereas IEs did not.

Tankan's figures for the three- and five-year-ahead expected output prices are compiled as the cumulative change rates relative to the current level. Figure 3 modifies the released figures and converts them into annualized change rates from one to five years ahead.

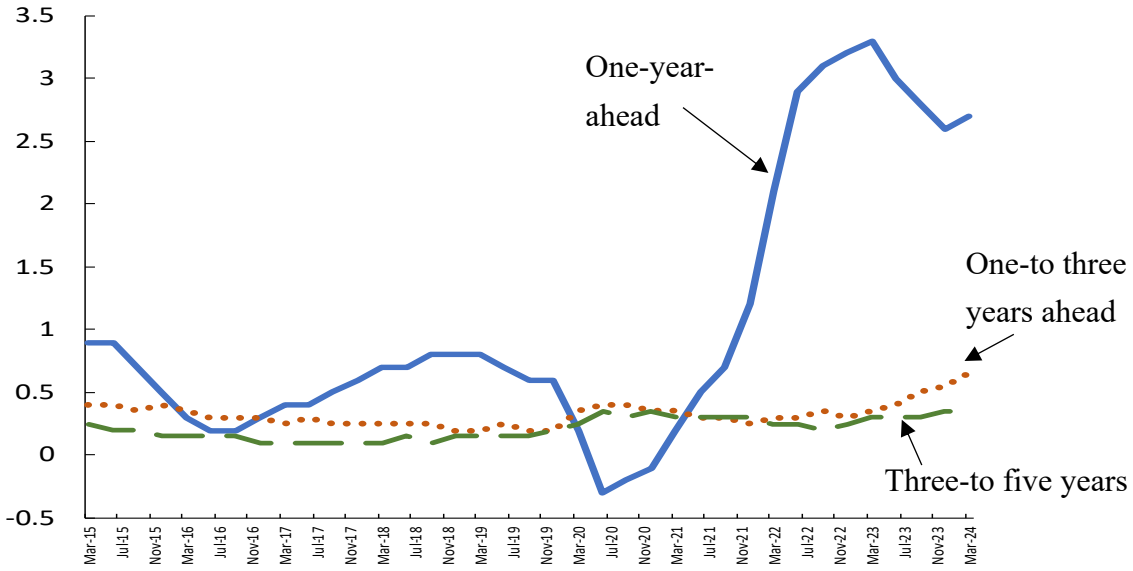
(Figure 2) Firms' IEs and expected output prices on a one-year-ahead basis

(Source) Bank of Japan. Data indicated include firms with all-industries and all-size.

Only the one-year-ahead expected output prices are affected by actual prices. Annualized changes in expected prices for one-to-three years and three-to five years moved stably at approximately 0.5 percent, despite significant changes in the CPI. Looking closely, in the pre-pandemic period, three-to-five years ahead expectations fell

to 0.2 to 0.3 percent. In the recent period, one-to three-year expectations showed slight increases. Overall, while Japanese firms expected a 1 to 2 percent increase in general prices, they assumed a modest 0.5 percent annual increase in their output prices.

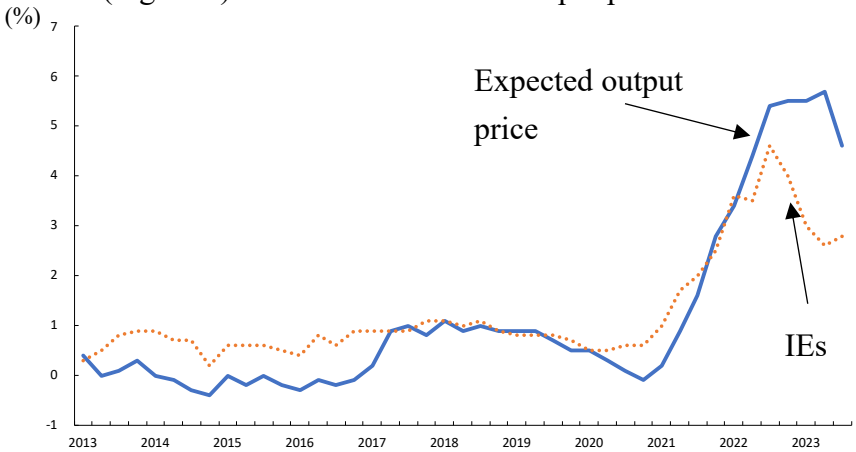
(%) (Figure 3) Japanese firms' annualized expected output prices



(Source) Bank of Japan. Data indicated include firms with all-industries and all-size.

Outside Japan, expectations of output prices are also available in the survey conducted by the central bank of Italy (Figure 4). The survey began in 2013, a year earlier than in Tankan. Figure 4 shows that expectations of output prices and general prices moved very closely. One difference from the Tankan survey results is that Italian IEs fell significantly faster than their output price expectations during the current inflationary phase.

(Figure 4) Italian firms' IEs and output prices

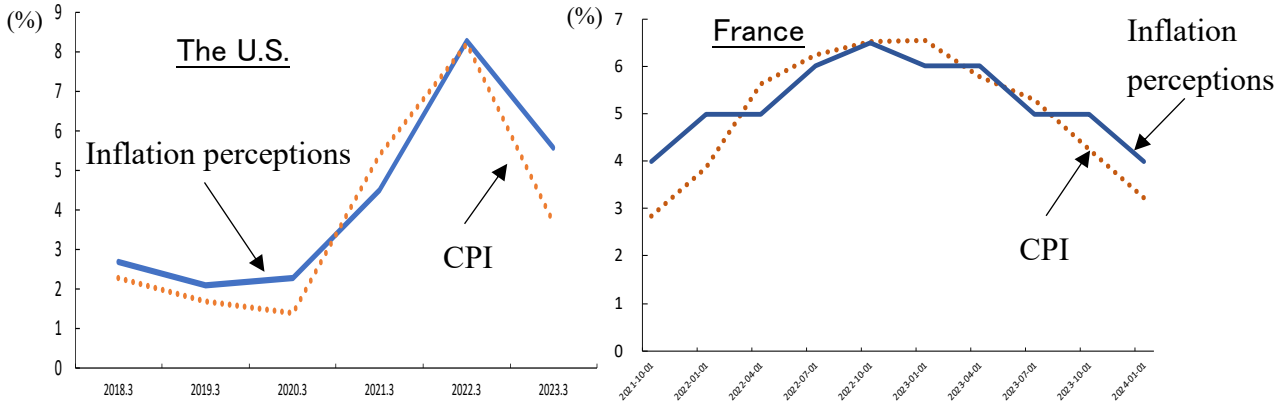


(Source) The central bank of Italy. Data indicated include firms with all-industries and all-size.

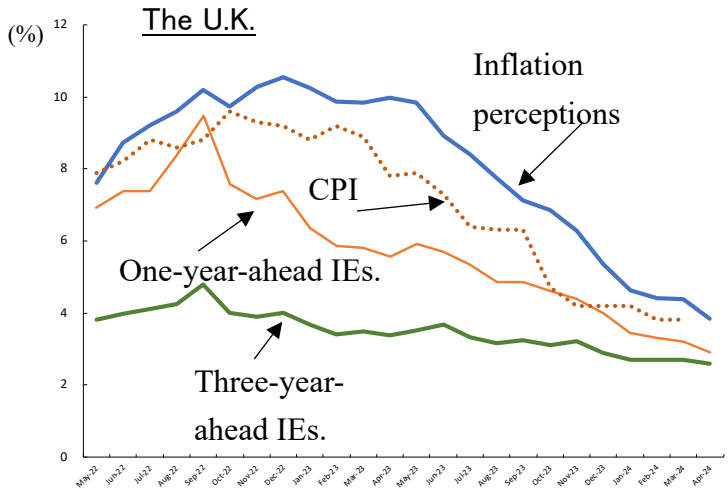
3.3. The relationship between the firms' inflation perceptions and the IEs

Households' IEs are significantly influenced by how they perceive current inflation rates, or inflation perceptions. Although Tankan does not cover inflation perceptions, surveys conducted in the U.S., U.K., and France do. Although these surveys commonly suffer from relatively short sample periods, the inflation perception of firms moved closely with the CPIs, except in the U.K., where perceptions exceeded the CPI. Since household inflation perceptions are significantly above the actual CPI in most developed countries (Japanese households shown in Figure 8), this suggests that firms and households have different IEs formation mechanisms.

(Figure 5-7) Inflation perceptions of firms in the U.S., U.K., and France

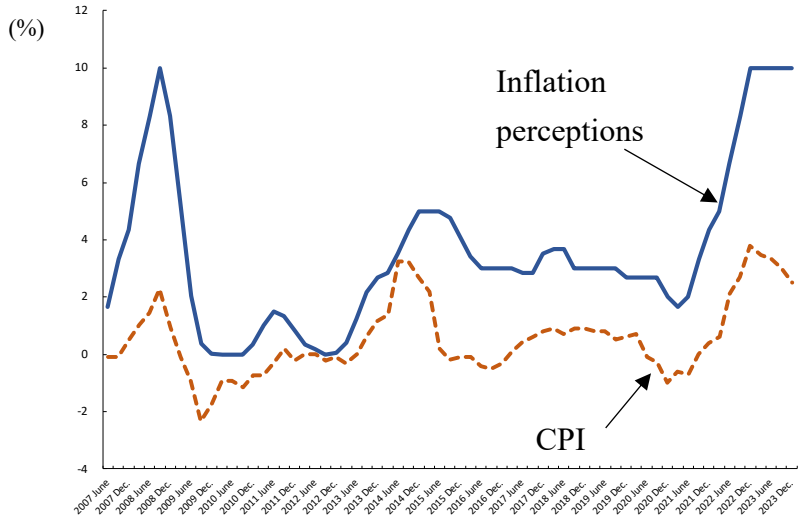


(Source) FRB of Cleveland and BLS for the U.S., Central bank of France and FRB of St. Louis for France



(Source) Decision Maker Panel, Office for National Statistics.

(Figure 8) Inflation perceptions in Japanese households



(Source) Bank of Japan and the Cabinet Office. CPI excludes fresh foods.

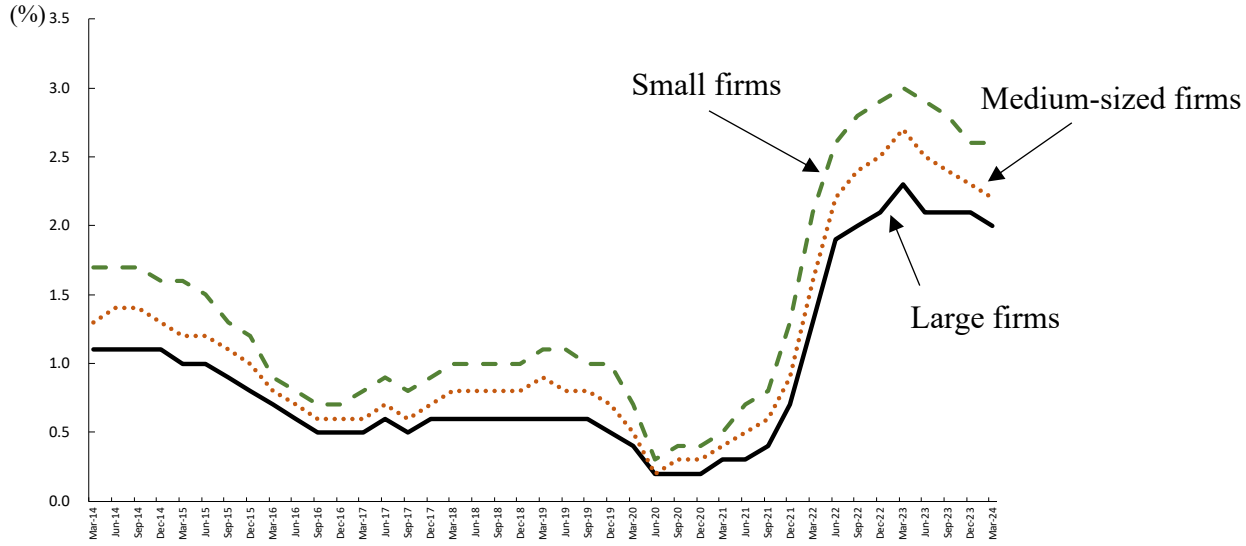
3.4. IEs by the size of firms

Tankan's IE survey has a unique advantage over other surveys because of its large sample size, which exceeds 10,000 firms. This enables a detailed analysis of IEs by firm size and industry type. This section analyzes the firms' IEs according to their size.

Figure 9 clearly shows that levels of IEs have been stable at "large firms <medium sized firms <small firms" for the whole sample period. Since larger firms have relatively more information on general prices and macroeconomic conditions than smaller firms, larger firms' upward bias of IEs relative to the CPI is clearly less than that of smaller firms.

Figure 10 shows the expected output prices according to firm size. The output prices of large and medium-sized companies moved similarly, while those of small-sized firms have been higher than those of the other two, especially during the current inflationary phase. Because the IEs of small firms are higher than those of large firms, as shown in Figure 9, small firms seem to expect a larger increase in their output prices in the future.

(Figure 9) IEs by the size of firms



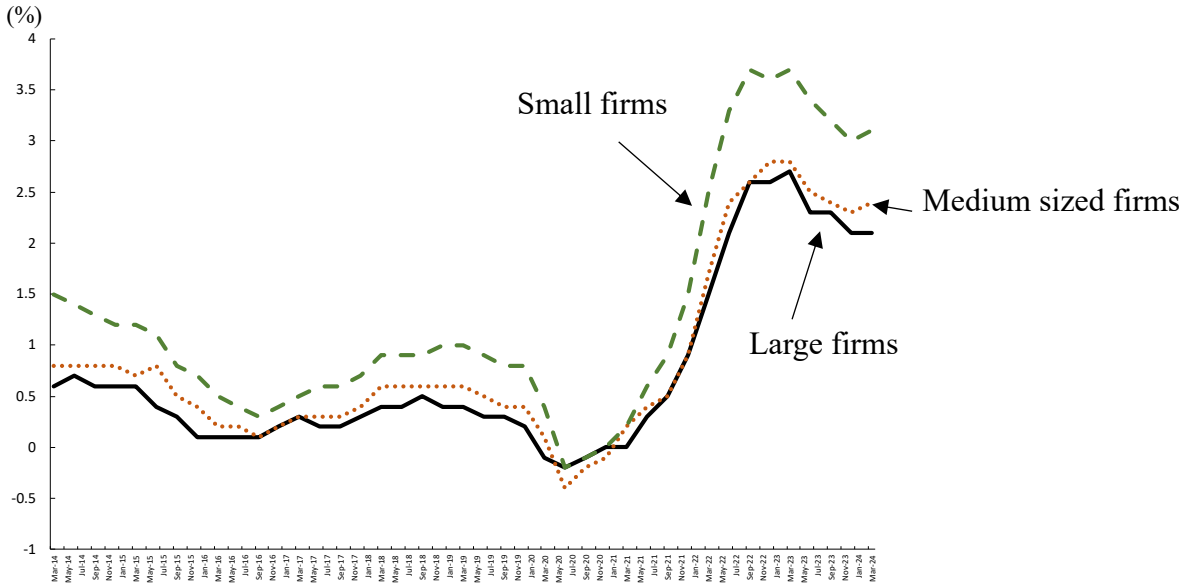
(Source) Bank of Japan. Data indicated include firms with all-industries and all-size.

The Bank of Italy conducts a survey of IEs depending on the size of the firms (Figure 11). During the current inflationary phase, although the IEs of small firms exceeded those of larger firms, the difference seems smaller than those from Tankan. One of the main reasons behind this phenomenon is its unique survey method, in which information on the current inflation rate is given to respondents just before asking their IEs.

Economists criticize this unique survey method because it significantly reduces the upward bias of IEs relative to the CPI.[4] In fact, if we compare Italian IEs (Figure 12) with those in Tankan (Figure 1), the Italian survey's gaps between long- and short-term IEs are unnaturally smaller than those in Tankan, especially during the pre-pandemic period.

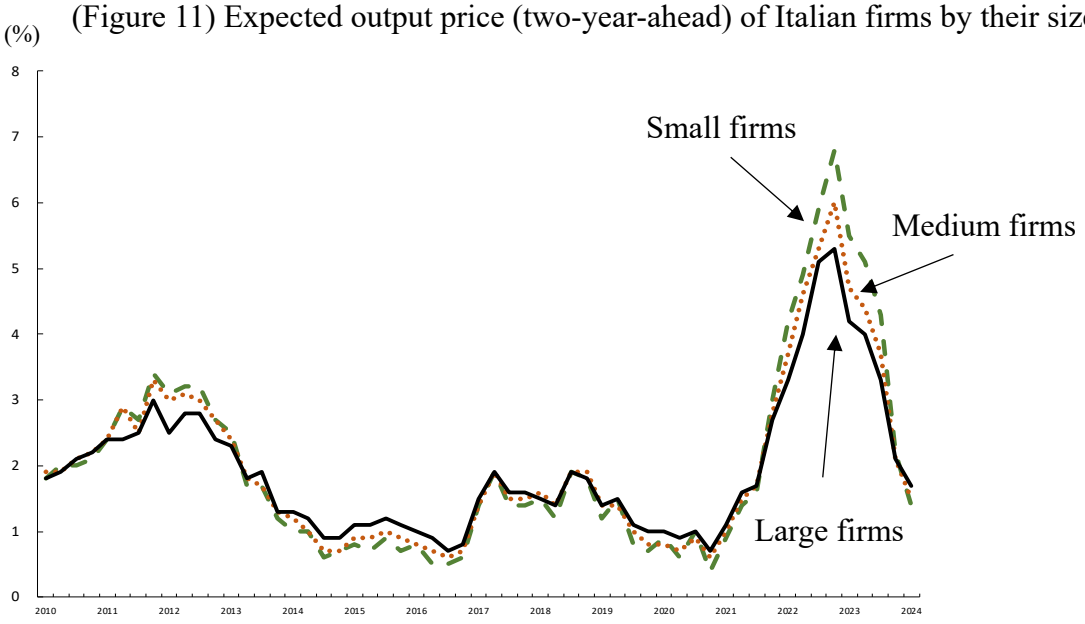
[4] Savagnac et al. (2021).

(Figure 10) Expected output price (one-year-ahead) by Japanese firm sizes



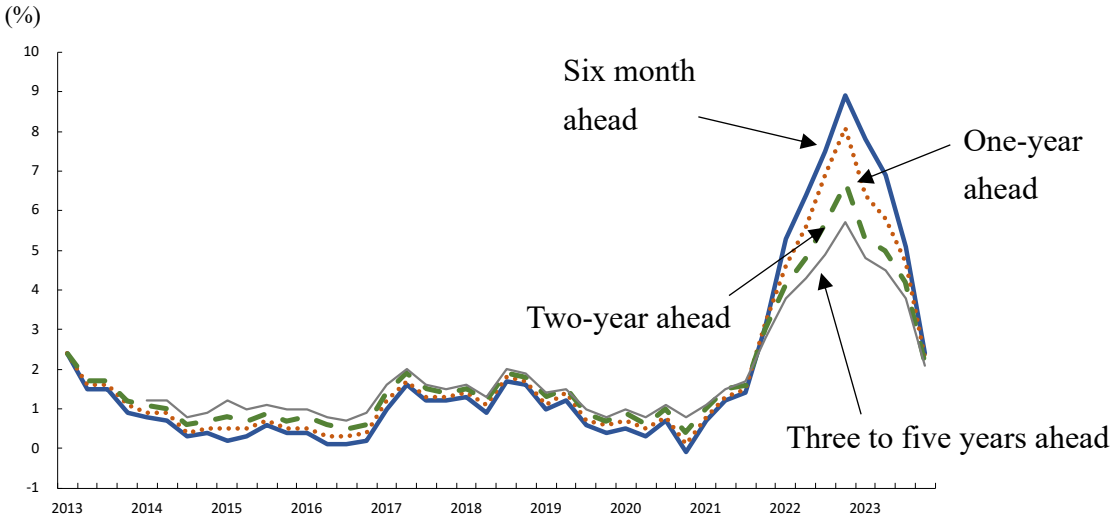
(Source) Bank of Japan. Data indicated include firms with all-industries and all-size.

(Figure 11) Expected output price (two-year-ahead) of Italian firms by their size



(Source) Bank of Italy.

(Figure 12) IEs of Italian firms (six month, one-year, two-year, and three to five years ahead)



(Source) Bank of Italy.

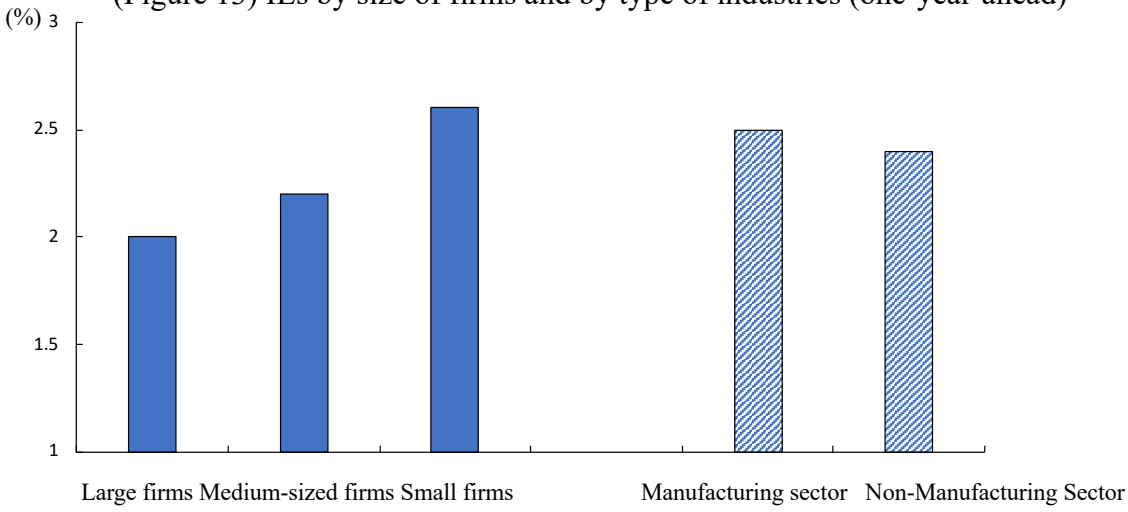
3.5. IEs by type of industries

The Tankan data can be broken down by industry type. Figure 13 shows the IEs of the manufacturing and nonmanufacturing sectors. The difference between the two sectors is only 0.1 percent point, which is relatively small compared to the 0.6 percentage point difference in IEs between large and small firms.

Figure 14 shows the standard deviations (SDs) of 36 industries (19 manufacturing and 17 non-manufacturing industries). In this graph, an increase in the SDs implies that the IEs of different types of industries are more widely dispersed.

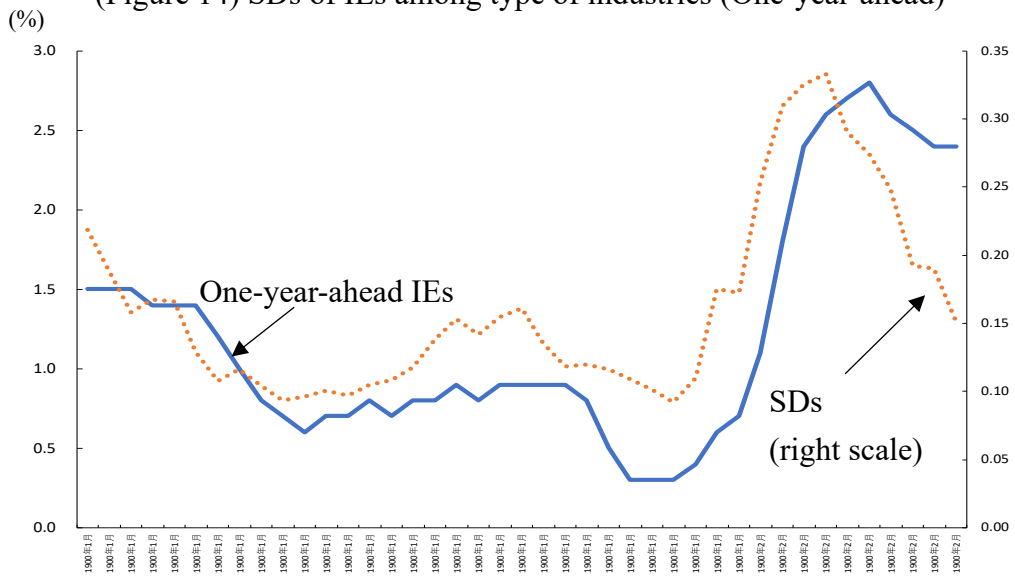
Although the SD level was relatively stable during the pre-pandemic period, it began to surge in tandem with IEs during the current inflationary phase. The SDs peaked in the middle of 2022 and fell significantly afterwards, such that the level of SD in March 2024 was almost equal to that at the beginning of 2021. On the other hand, IEs peaked at the beginning of 2023 but remained at 2.5 percent even in March 2024. Consequently, the gap between IEs and SDs has widened. It seems that at the beginning of 2021, the SDs were pushed up significantly by huge uncertainties created by the pandemic and then peaked and fell sharply as the pandemic was gradually contained and uncertainty diminished.

(Figure 13) IEs by size of firms and by type of industries (one-year-ahead)



(Source) Bank of Japan. Survey was conducted in December 2023.

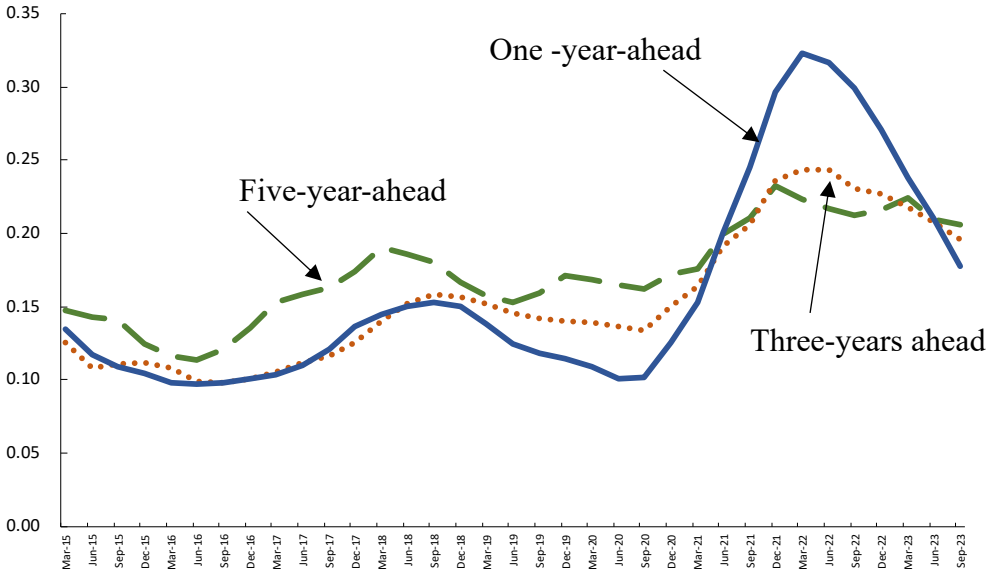
(Figure 14) SDs of IEs among type of industries (One-year-ahead)



(Source) Bank of Japan.

Figure 15 plots the SD for one, three, and five years ahead for the Tankan firms. This clearly indicates that the sharp increase in the SDs was limited to expectations one year ahead, which showed synchronized movement with a surge in actual inflation and IEs.

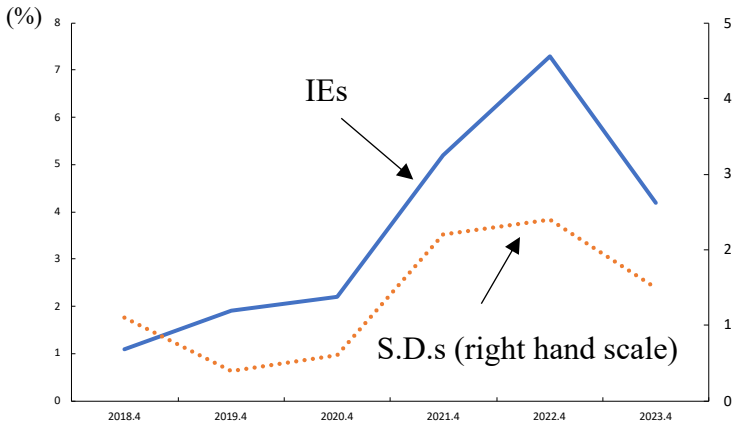
(Figure 15) SD of Japanese firms (one-, three- and five-years ahead)



(Source) Bank of Japan.

No survey outside Japan provides detailed IEs by industry type. However, a survey conducted by the Federal Reserve Bank of Cleveland revealed SDs and IEs (Figure 16). Similar to Tankan, the SDs increased significantly during the current inflationary phase.

(Figure 16) U.S. firms' IEs and SDs (one-year-ahead)



(Source) FRB of Cleveland.

3.6. Comparing IEs with other economic entities

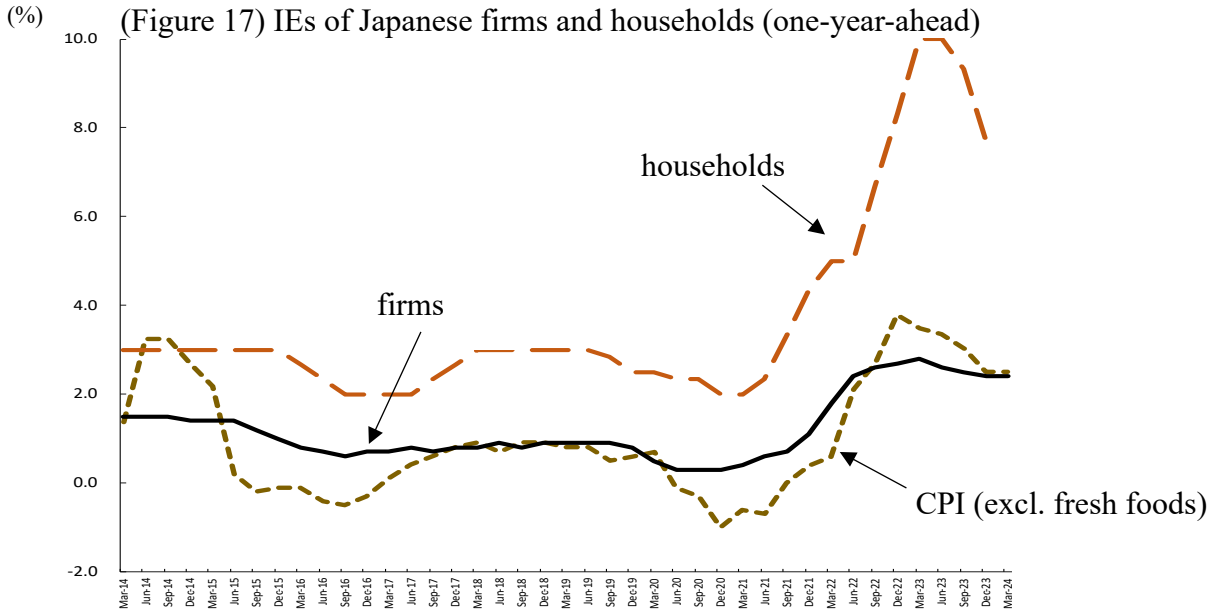
This section compares firms' IEs with those of other economic entities, such as households and economists. In case of Japan, households' IEs are available using the

"Opinion Survey" conducted by the Bank of Japan. Figure 17 shows the IEs of firms and households, along with the CPI. This clearly indicates that the IEs of firms are consistently lower than those of households.

The figure also shows that (1) the IEs of firms comoved with those of households and CPI, (2) during the current inflationary phase, the increasing pace of households' IEs exceeded those of firms; therefore, the peak rate for households reached 10%, while those of firms remained at 3 %, and (3) during the current inflationary phase, the peak period of IEs of firms was several quarters earlier than that of households.

The Bank of Japan also published a similar graph showing various IEs in the "Outlook for economic activities and prices" (Figure 18). According to the figure, firms' IEs moved consistently above those of professionals, including economists, financial market participants, and households, especially during the current inflationary phase (shapes of IEs in Figure 18 differ from Figure 17 because the former plots five-year-ahead IEs, while the latter shows those of one-year-ahead).

(Figure 17) IEs of Japanese firms and households (one-year-ahead)

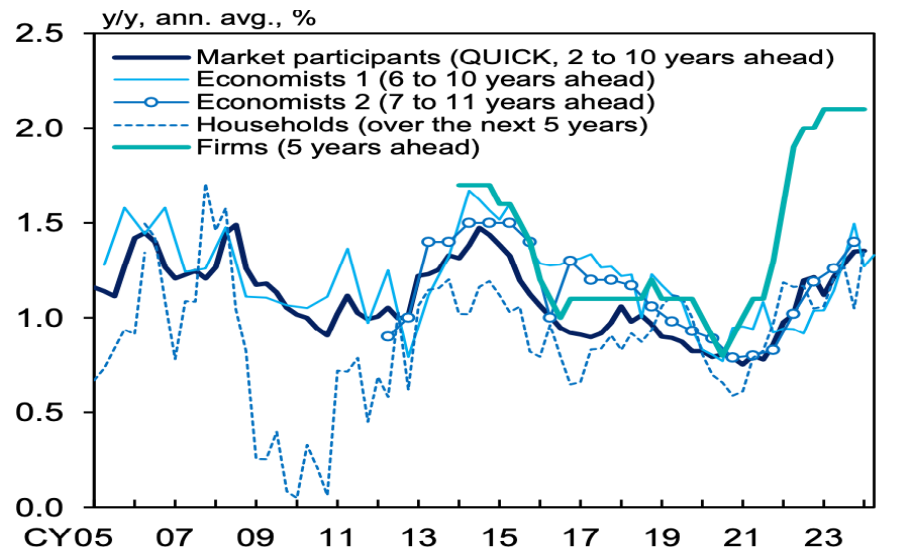


(Source) Bank of Japan and the Cabinet Office.

Although both Figures 17 and 18 depend on the same "Opinion Survey" data for households IEs, the significant differences in the level of IEs were caused by the data themselves and the calculation methods. The survey asked the respondents to respond to their IEs in two ways. The first directly asked about IEs qualitatively, and the second asked respondents to select from five choices depending on the magnitude and direction

of IEs.[5] Figure 17 uses the median figure obtained from the quantitative answers, whereas figure 18 depends on a five-choice answer and uses an econometric method to quantify the responses. The Bank of Japan explained the reason for choosing qualitative answer rather than quantitative ones by suggesting the facts that quantitative answers contain many "bias" such as answers concentrated on integers, multiplier of 5, and 0 percent. The Bank concluded that using the median figure of quantitative answers could not precisely represent the complex distribution of household IEs.[6]

(Figure 18) IEs of Japanese economic entities



Sources: Bank of Japan; QUICK, "QUICK Monthly Market Survey <Bonds>"; JCER, "ESP Forecast"; Consensus Economics Inc., "Consensus Forecasts."
Notes: 1. "Economists 1" shows the forecasts of economists in the *Consensus Forecasts*; "Economists 2" shows the forecasts of forecasters surveyed for the *ESP Forec*
2. Figures for households are from the *Opinion Survey on the General Public's Vi and Behavior*, estimated using the modified Carlson-Parkin method for a 5-cho question.
3. Figures for firms show the inflation outlook of enterprises for general prices (all industries and enterprises, average) in the *Tankan*.

(Source) Bank of Japan "Outlook for Economic Activities and Prices" Chart 39, April 2024.

However, the unique response patterns of qualitative answers are common for household IEs, not only in Japan but also in many major developed countries. Such a pattern is considered to be closely related to psychological factors and frequently occurs

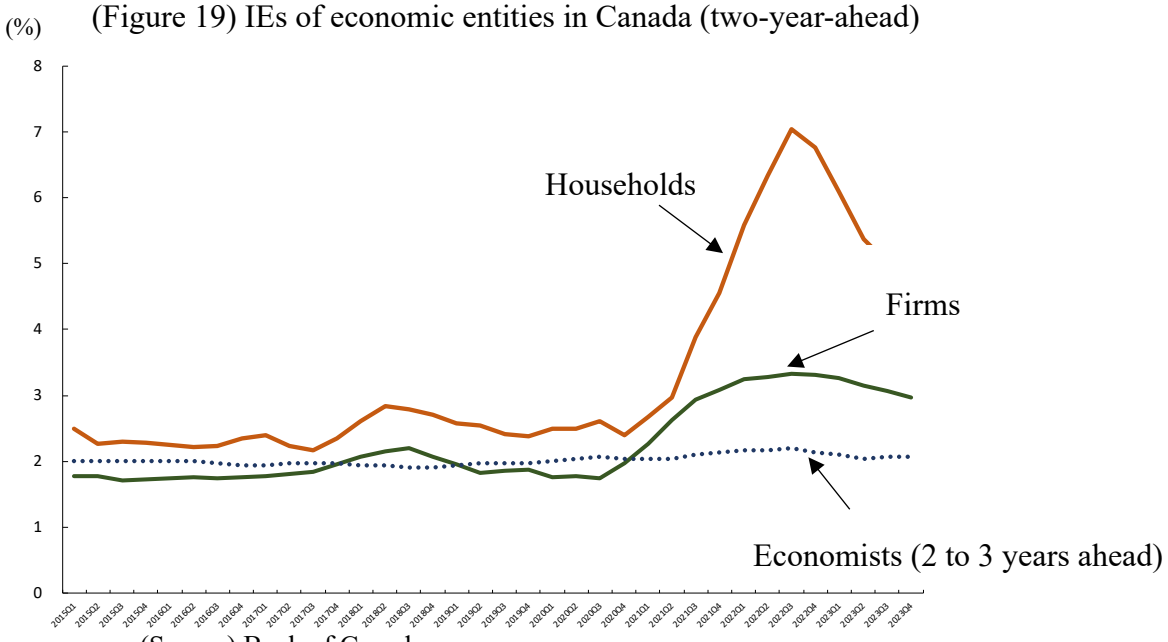
[5] The qualitative answers consist of (price will) "go up significantly," "go up slightly," "unchanged," "go down slightly," and "go down significantly." They used the modified Carlson-Parkin method to quantify the data.

[6] Bank of Japan (2018).

when respondents are not confident in their answers. Therefore, it is unlikely that a unique pattern emerged because of technical problems, such as survey methods or respondents' irresponsibility. Because respondents are not confident about their responses, it is hopeless to improve the quality of the outcome of the five-choice responses by mathematically quantifying the data. This mathematical modification seems to have created an unrealistic situation, as shown in figure 18, where households' IE was as low as that of professionals.

Other countries offer data to compare firms' IEs to those of other economic entities. First, the Bank of Canada publishes the IEs of households, firms, and economists (Figure 19). This indicates that the level of firms' IEs is located between those of households and professionals and that the IEs of households surged in the current inflation phase, similar to Japan in Figure 17.

(Figure 19) IEs of economic entities in Canada (two-year-ahead)

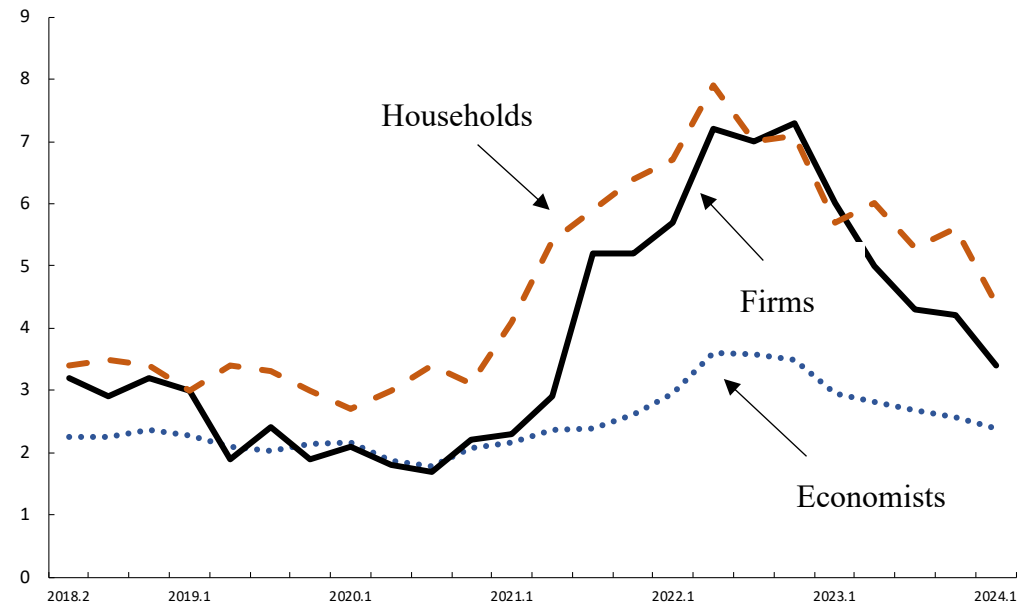


(Source) Bank of Canada.

Second, in the U.S., firms' IEs are also located between households and economists, similar to Japan and Canada. However, in the current inflationary phase, firms' IEs are closer to those of households than those of economists (Figure 20).[7]

[7] In the U.S, firms expected prices are also available from the Federal Reserve Bank of St. Louis.

(%) (Figure 20) IEs of economic entities in the U.S. (One-year-ahead)



(Source) FRB of Cleveland, FRB of Philadelphia, and University of Michigan.

Third, in Norway, firms' IEs also lie between economists and households, except in the current inflationary phase(Figure 21). The peak rate of IEs of firms is 6 percent and that of households is approximately 4.5 percent.

Fourth, the Bank of France published a research paper in 2021 that presented a table indicating that firms' IEs lie between those of households and economists (Figure 22).

Other studies also state that firms' IEs lie between those of households and firms. In addition, a study published in 2022 in the U.S. pointed out that firms' IE formation mechanism differs from those of households and economists.[8] Another study, published in the U.S. by the Federal Reserve Bank of Cleveland, calculated the SDs of firms' IEs and found that they were much smaller than those of households.[9]

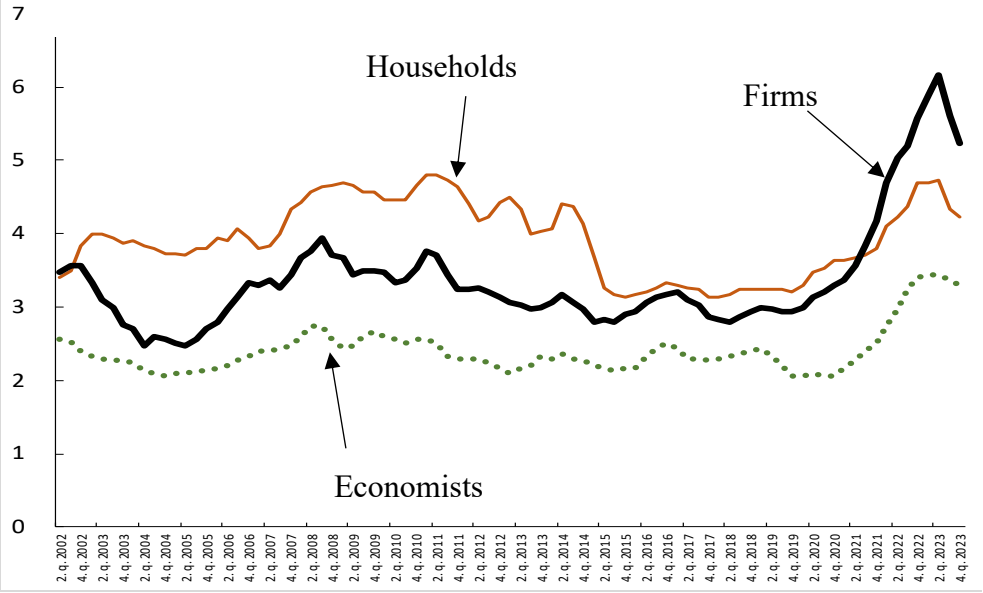
This evidence suggests that the in terms of IEs, the relationship "economists<firms<households" holds. Thus, the Bank of Japan's chart (Figure 18) seems to be an outlier.

Although the sample period begins in 2011, the survey asks firms about their unit costs in spite of IEs and the surveyed area is limited to southern part of the U.S.

[8] Candia et al. (2022).

[9] Garciga et al. (2023).

(Figure 21) IEs of economic entities in Norway (two-year-ahead)



(Source) Norges Bank.

(Table 2) IEs of economic entities in France (at the end of 2021)

Periods	Firms	Households	Consensus forecast
Past 12 month	1.7	4.0	—
One-year-ahead	1.9	2.0	0.9
Two-year-ahead	2.0	—	1.3
Five-year-ahead	2.2	—	1.7

(Source) Bouche et al. (2021).

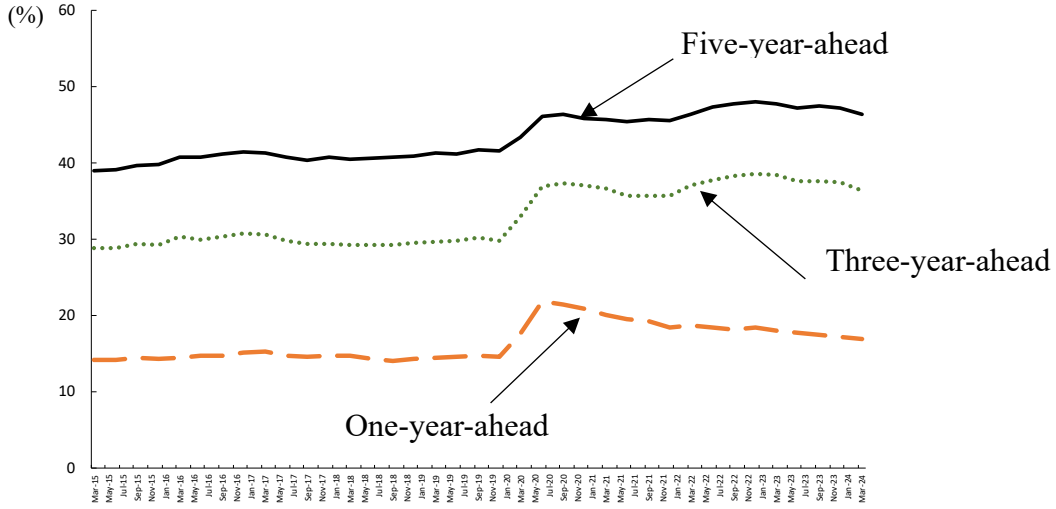
4. Formation mechanism of firms' IEs

4.1. How confident are firm in responding to IEs?

This section describes the formation mechanisms of firms' IEs.

First, this subsection uses Tankan data to examine how confident are firms in answering about their IEs. Tankan's questionaries allow a "don't know" answer if firms are unable to come up with numerical IEs.

(Figure 22) The share of firms responding "don't know" in Tankan

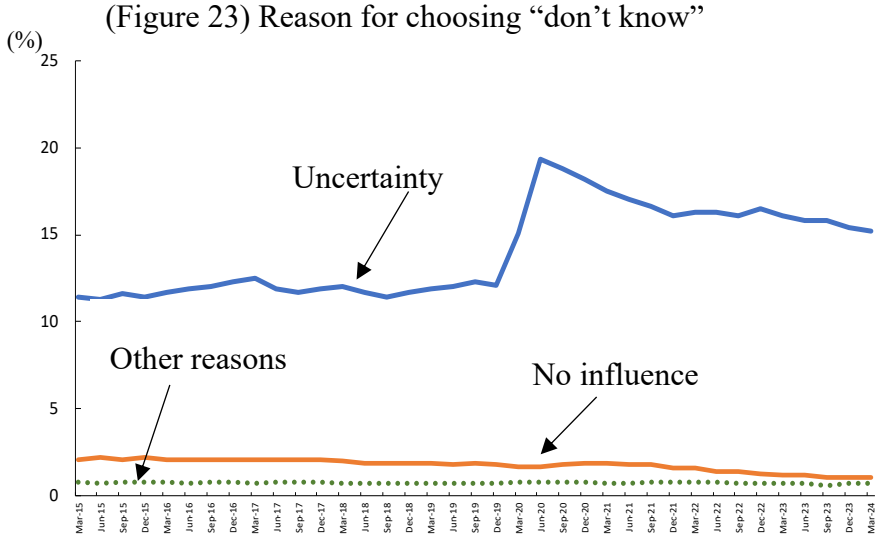


(Source) Bank of Japan. Data indicated include firms with all industries and size.

Figure 22 plots the share of "don't' know" responses. This share increases as the duration of the expectation periods becomes longer. For example, before the pandemic, the share was approximately 15 percent for one-year-ahead, jumped to 30 percent for three-year-ahead, and reached approximately half of respondents for five-year-ahead. Understandably, the longer the expectation period, the more difficult it is to provide a quantified answer about IEs owing to increased uncertainties. Still, it is remarkable that almost half of the firms have no view about five-year-ahead.

In addition, the share of "don't know" has increased an additional 5 to 10 percentage point since the first half of 2020 for every expectation period. At the time of writing this article in March 2024, the share of three- and five-year-ahead remained high. Tankan further asks the reasons for choosing the "don't know" answer. Figure 23 showed that most respondents picked "uncertainty." Judging by the timing, the outbreak of the pandemic may have caused the increased uncertainty among firms.

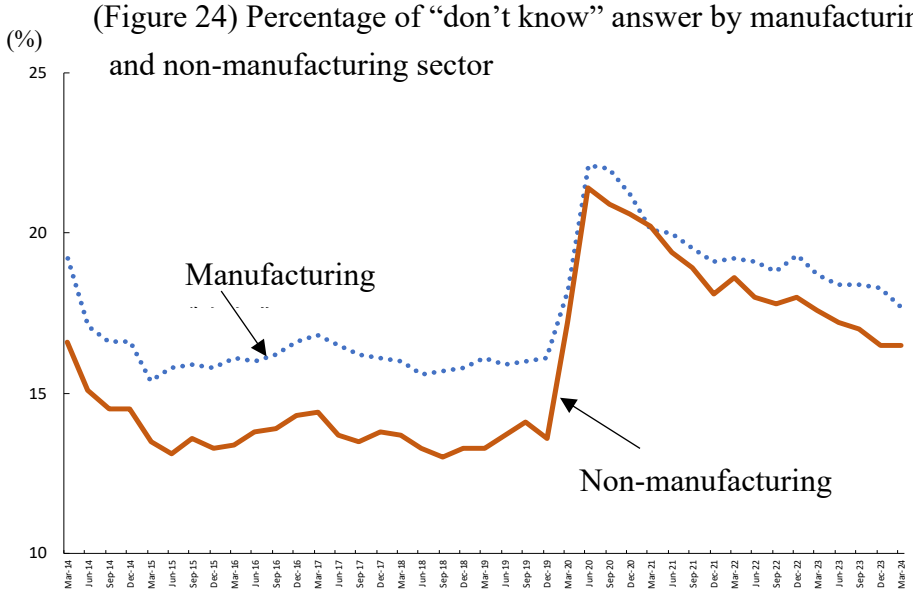
(Figure 23) Reason for choosing "don't know"



(Source) Bank of Japan. Responses for one-year-ahead IEs. Data include firms with all industries and size.

Next, Figure 24 depicts the share of "don't know" by manufacturing and non-manufacturing sectors. Before the pandemic, the manufacturing sector's share was higher than that of the non-manufacturing sector. This might reflect the fact that (1) the demand and supply conditions of manufacturing goods fluctuate more widely than those of service goods and (2) the manufacturing sector faces higher uncertainty due to fluctuations in overseas demand and volatile foreign exchange rates.

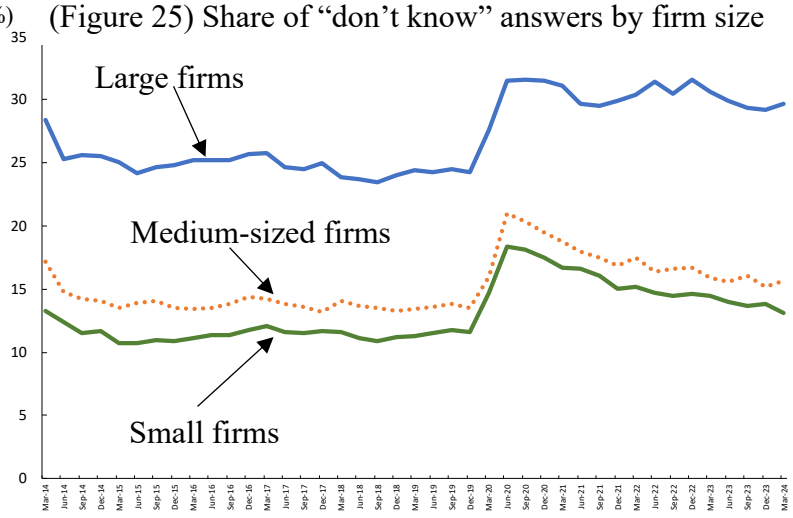
(Figure 24) Percentage of "don't know" answer by manufacturing and non-manufacturing sector



(Source) Bank of Japan. Responses for one-year-ahead IEs. Data include firms with all industries and size.

Figure 25 shows the share of "don't know" answer by the firm size. The share of large firms is approximately 10 percent point higher than that of SMEs. This is odd because large firms generally seem to have a relative advantage in gathering macroeconomic information and developing detailed long-term business plans.

(%) (Figure 25) Share of "don't know" answers by firm size



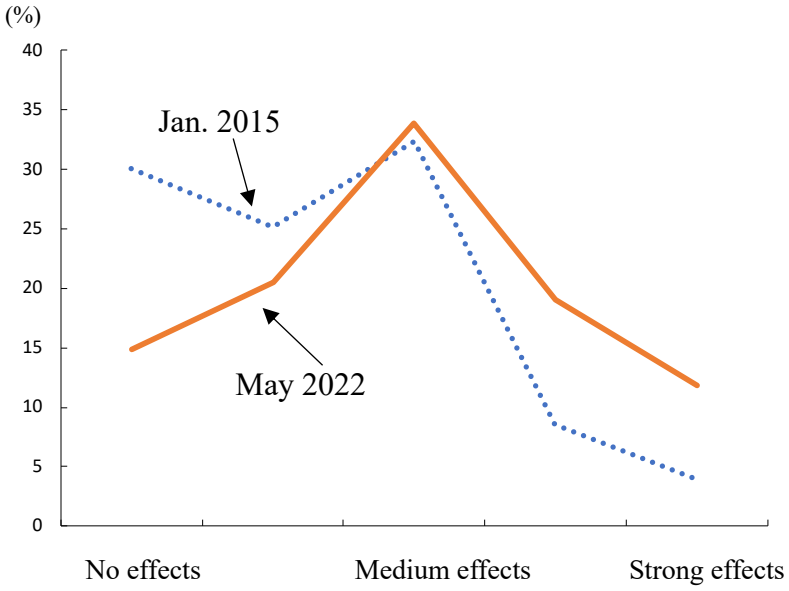
(Source) Bank of Japan. Responses for one-year-ahead IEs. Data include firms with all industries and size.

4.2. Business operations and IEs

Using prior studies, this subsection examines how IEs affect firms' business operations. A U.S. study asked firms about how much general prices affected their business operations (Figure 26).[10] The figure plots the responses for two different periods: 2015, when the inflation rate was modest, and 2022, when the inflation rate increased rapidly during the pandemic. The 2015 responses showed that almost 90 percent of firms chose low effect response answers such as "no effects" or "medium effects." In contrast, the responses of 2022 shifted rightward. The share of "no effects" declined while that of "strong effects" increased. This indicates that the information value of general prices for business operations varies according to the level of inflation rate.

[10] Meyer and Sheng (2021).

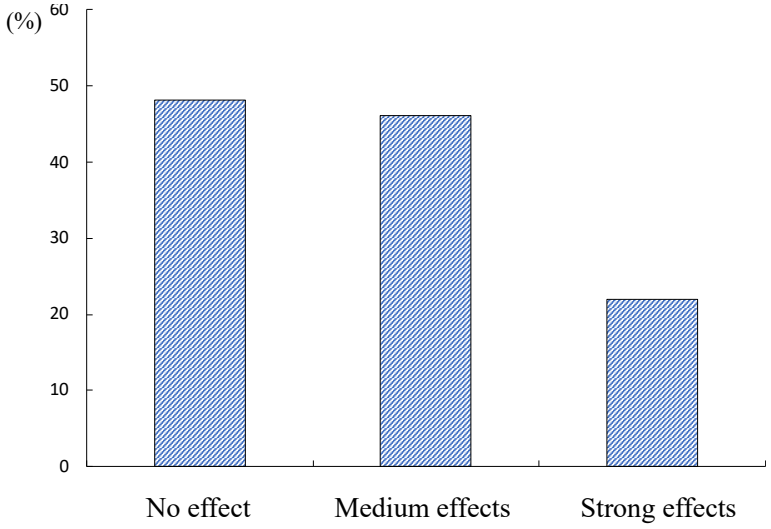
(Figure 26) The effects of general prices on U.S. firms' business operations



(Source) Meyer and Sheng (2021)

The same study asked firms about the effects of general prices on product prices (Figure 27). Surprisingly, approximately half of the surveyed firms answered "no effect." Thus, input prices, rather than general prices, are the major factors determining product prices.

(Figure 27) The effects of general price movement on U.S. firms' product prices



(Source) Meyer and Sheng (2021). Survey was conducted in 2015.

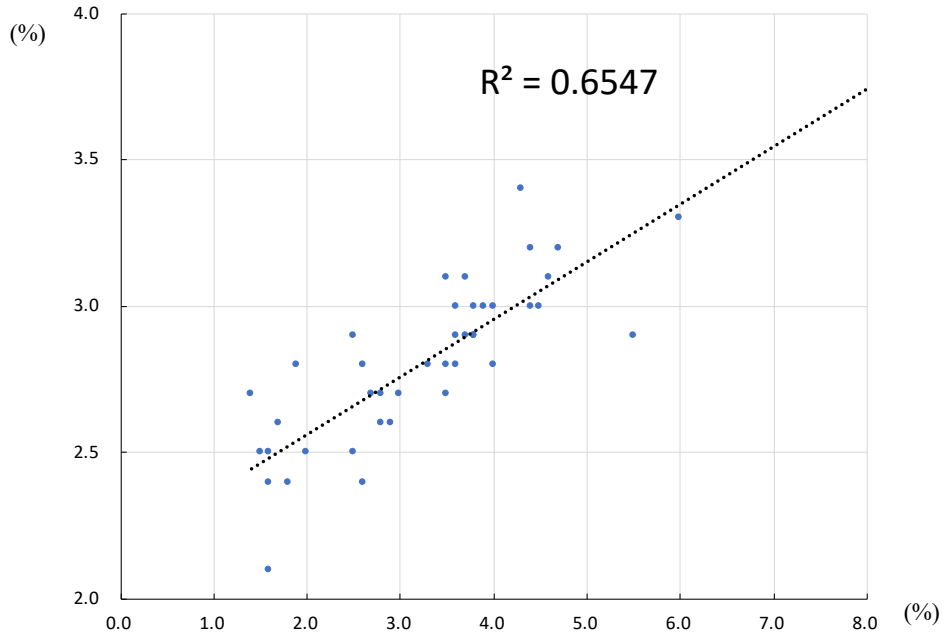
4.3. Formation process of firms' IEs

This subsection uses Tankan and other overseas surveys to analyze the formation process of firms' IEs.

The following three pieces of evidence suggest that firms are *not* perfectly rational when forming IEs. First, although rational firms should form identical IEs based on the same information, Figure 9 using Tankan data indicates that the level of IEs diverges with firm size. Second, the level of firms' IEs is consistently higher than the actual CPI or professional forecasts both inside and outside Japan (Figures 17, 19, 20, and 21). Such upward bias frequently occurs when entities' inflation perceptions, which provide the basis for IEs, are inaccurate. Third, IEs by industry type in the Tankan survey are significantly affected by their own output prices (R^2=0.65). If the firms are perfectly rational, the two variables should show no correlation (see Figure 28).[11]

These observations contradict rational expectation theory, where economic entities grasp all economic conditions perfectly and decide on IEs with full information.

(Figure 28) Output prices (vertical axis) and IEs (horizontal axis) by industry type in Tankan survey



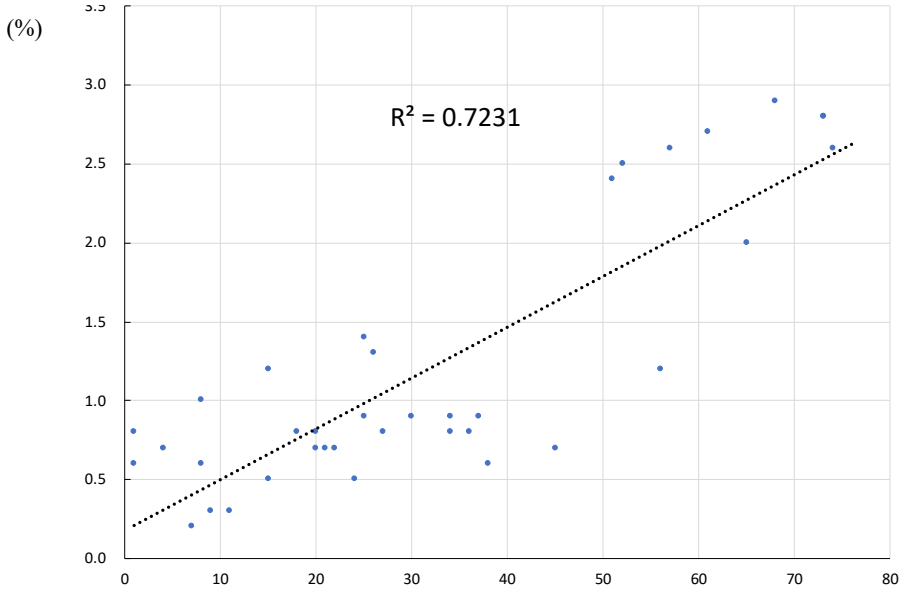
(Source) Bank of Japan. Data are one-year-ahead IEs in March 2024.

[11] Albizia et al. (2023) also pointed out the same argument.

Since firms are not perfectly rational, are they following adaptive expectations theory, where IEs are calculated mechanically depending only on past and present data on inflation rates? This is not the case, since Figure 26 indicates that firms do care about IEs when they face large shocks, such as pandemics or inflation surges. In addition, the Tankan data suggest that fluctuations in firms' input costs affect their IEs (R^2=0.72), which contradicts the adaptive expectation theory where only past and present inflation rates matter (Figure 29).[12]

Another survey conducted in New Zealand in 2013 found that firms set priorities in monitoring macroeconomic data. For example, the share of firms closely monitoring GDP reached approximately 80 percent, whereas that of inflation rates was about 50 percent.[13] The survey also pointed out that: (1) firms' forecast errors for highly prioritized GDP were smaller than those for inflation rates, (2) firms belonging to highly competitive industries formed accurate IEs, and (3) firms generally collected abundant price information about their own industries. Such observations also imply that firms do *not* form IEs through simple calculations, as adaptive expectations theory suggests.

(Figure 29) D.I. of input cost by type of industries (horizontal axis) and IEs (vertical axis)



(Source) Bank of Japan. Data period is from March 2015 to December 2023 and the data are one-year-ahead IEs.

[12] Richards and Verstraete (2016) also pointed out that the input price affects firms' IEs.
[13] Coibion et al. (2015).

The RI theory is a useful framework to explain such seemingly inconsistent firms' behaviors where firms are not perfectly rational nor simply adaptive.[14] RI assumes that firms are generally rational and motivated to efficiently allocate limited resources. Hence, they intentionally neglect information that has a relatively small impact on their activities and requires non-negligible costs to make accurate estimations. Thus, RI's basic idea is that firms are rationally inattentive to low-value information.

According to the RI, firms assign priorities among macroeconomic indicators according to their impact on business activities at the time; hence, priorities can vary. For example, the priority of IEs increases when an inflation surge or a pandemic occurs. However, the long-term deflationary period seen in the pre-pandemic period lowered the priority of IEs.[15] This priority also increases when competitiveness within the industry becomes fierce and fluctuations in input costs increase.

Another study showed that firms in high-inflation countries, such as Uruguay, Ukraine, and Argentina, place higher priority on inflation rates and analyze IEs more carefully than firms in low-inflation countries, such as the U.S. and New Zealand.[16] Another study conducted in the U.S. reported that firms expected a prolonged inflation surge after the pandemic earlier than economists. This is because economists regarded the inflation surge as a temporal phenomenon due to supply shortages; meanwhile, firms were aware of the ongoing increasing vulnerability in global supply chains, and therefore, expected prolonged inflation surges.[17]

4.4 Unanchored firms' IEs

Anchored IEs imply that long-term IEs move stably around the central bank's inflation target (often set at 2 percent) without being significantly affected by the fluctuations in short-term IEs.[18] During the pre-pandemic period, since inflation rates moved rather stably at low levels in many developed countries, IEs were also relatively stable. Studies focusing on this period concluded that IEs were anchored. The situation changed dramatically after the current inflationary phase, where short-term IEs notably responded to the inflation surge. Furthermore, the long-term IEs, which should be stable

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[14] Bank of Japan (2016, 2017, (2019), Coibion et al. (2015) and Richards and Verstraete (2016) also supported RI in firms' IEs formation.
[15] RI is also useful in explaining the upward bias of IEs of households compared to professionals and firms. See Fukuhara (2024).
[16] Coibion et al. (2015).
[17] Meyer and Sheng (2021).
[18] Weber et al. (2022).

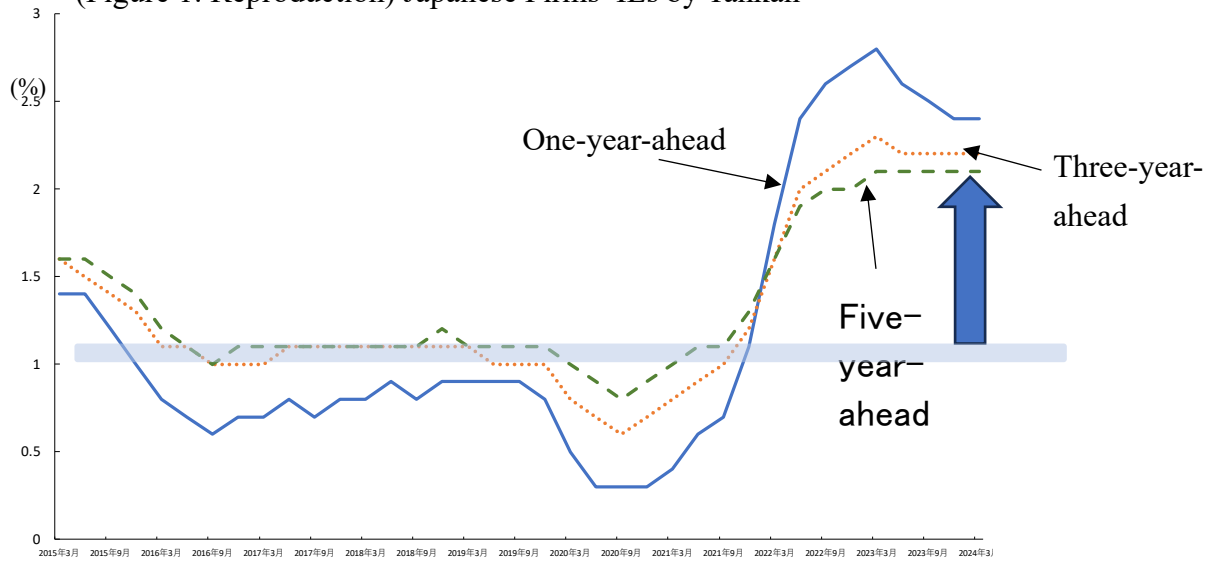
regardless of the movements in short-term IEs, moved upward.

This "de-anchoring" of long-term IEs is evident in Japan (Figure 1), Italy (Figure 12), the U.K. (Figure 7), and Canada (figure 19). Most studies also reported that firms' IEs are not anchored.[19]

First, only 25 percent of firms were aware of a 2 percent inflation target in the U.S. Meanwhile, only one-third knew the target in New Zealand, where the central bank has continued its inflation targeting policy for 25 years.[20]

Lastly, since Candia et al. (2021) pointed out five conditions for anchored IEs to meet, the question of whether Japanese firms' IEs are anchored is examined below based on these conditions:

(Figure 1: Reproduction) Japanese Firms' IEs by Tankan



(Source) Bank of Japan. Data includes all firms sizes and types of industries.

① The average IEs should be close to the inflation target: In Japan, the target is 2 percent. Long-term IEs hovered around 1 percent before the pandemic and rose to 2 percent only recently.

② Fluctuations in IEs should be relatively small: The SD of Tankan firms is shown in Figure 15. The SD of one-year-ahead IEs significantly increased during the

[19] For example, Candia et al. (2022).
[20] Candia et al. (2022).

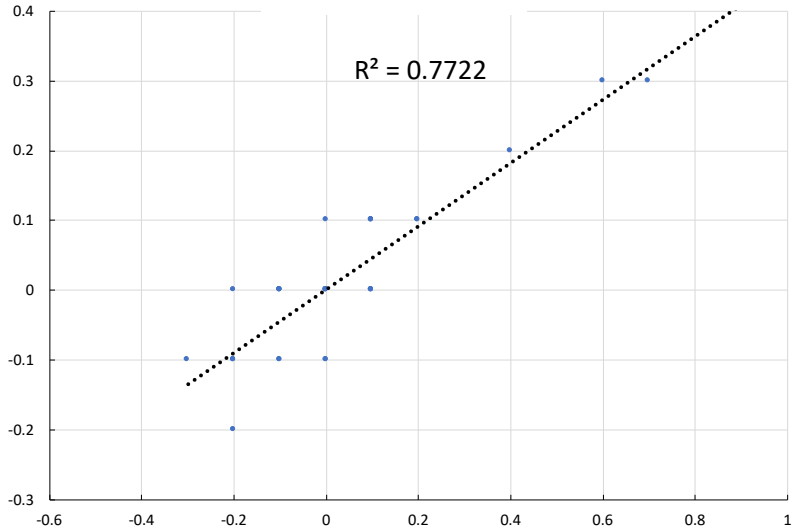
current inflation phase. An overseas study also showed that the SD of IEs was much larger than that of professionals.[21])

③ Firms should have confidence in their IEs: As Figure 22 shows, approximately half of Tankan firms chose "don't know." This suggests that firms are not confident in their forecasts.

④ IEs, especially those in the long term, should be stable: Figure 1 indicates that the five-year-ahead IEs shifted substantially from the 1 percent level prevalent in the pre-pandemic period to a 2 percent level in the current inflationary phase.

⑤ Long- and short-term IEs should not exhibit co-movement: Plotting the first difference of long/short IEs showed significant correlations ($R^2 = 0.77$, Figure 30), indicating that both variables exhibit co-movement.

(Figure 30) First differences between one- (horizontal axis) and five-year-ahead IEs (vertical axis)



(Source) Bank of Japan. Data include all firms sizes and types of industries. Calculation period was from June 2015 to September 2023.

Thus, Japanese firms' IEs are not anchored.[22]

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[21] According to Coibion et al. (2015), SDs of IEs for firms was 2.0%, households was 3.1%, professional was 0.2%.

[22] Using overseas data, Candia et al. (2021, 2022) and Coibion et al. (2015) also concluded that firms' IEs are not anchored. In Japan, households' IEs are also not anchored; see Fukuhara (2024).

5. Conclusion

This study analyzed firms' IE and their formation process during the current inflation phase. The main results are summarized below.

First, analyzing Tankan data revealed that Japanese firms' IEs moved around 1 percent before the pandemic. This rose to 3 percent for one-year-ahead and about 2 percent for five-year-ahead expectations during the current inflationary period. Although larger firms showed lower IEs than smaller firms, no distinct difference was observed between the types of industries. Data from different economic sectors showed that firms' IEs lie between those of professionals and households. About the half of firms answered "don't know" for five-year-ahead IEs due to economic uncertainty; this share increased an additional 5 to 10 percentage points after the pandemic.

Second, firms' IEs mechanisms do not follow a completely rational or adaptive expectations model. Rational expectations do not hold because of: (1) a wide dispersion of IEs by firm size, (2) a clear upward bias of IEs compared to the CPI, and (3) observed correlations between firms' expected output prices and IEs. Firms do not follow pure adaptive expectations either because (1) they assign higher priority to IEs when actual inflation soars and (2) IEs are affected by the movement in input costs.

RI theory became a useful framework for explaining such seemingly inconsistent firms' behaviors. RI assumes that firms intentionally and rationally ignore information that has relatively small value for their activities. According to the RI, firms assign a higher priority to IEs when inflation rates or input costs rise significantly, whereas they assign a lower priority to IEs if deflationary conditions last for a significant period.

Third, IEs are not anchored at the 2 percent inflation target (a state of IE moving stably around the central bank's inflation target). Even longer-term IEs, such as three- and five-year-ahead IEs, clearly rose during the current inflationary phase. Similar patterns are observed in the U.K., Italy, and other major developed countries.

Data and previous studies on this subject in and outside Japan are limited compared to those of households, professionals, and financial markets. This trend gradually began to change in the 2010s, as firms' pricing behavior during the low-inflation period attracted economists' interest. Accordingly, much data on firms' IEs, including those in Japan, was now being collected, albeit mainly by central banks.

Finally, studies on firms' IEs have several implications for central bank policy communication. First, central banks need to consider how they can reach medium and small firms whose IEs contain a larger upward bias than large firms. Second, methods or tools to promote firms' interest in IEs during the low-inflation period, when firms follow RI and the priority of inflation is lowered, should be examined. Third, central banks should explore how they can establish repetitive communication tools for firms that can help sustain the effects of policy communication.[23]

[23] A study abroad reported that firms revise their IEs downward (= decreasing upward bias of IEs) when the actual inflation rate was shown to respondents. However, the same survey conducted after six month revealed that the IE response resumed to the initial level.

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