



Bank of Japan Working Paper Series

# Effects of Inflation and Wage Expectations on Consumer Spending: Evidence from Micro Data

Yuichiro Ito<sup>\*</sup>  
yuuichirou.itou@boj.or.jp

Sohei Kaihatsu<sup>\*</sup>  
souhei.kaihatsu@boj.or.jp

No.16-E-7  
June 2016

Bank of Japan  
2-1-1 Nihonbashi-Hongokucho, Chuo-ku, Tokyo 103-0021, Japan

---

<sup>\*</sup> Monetary Affairs Department

Papers in the Bank of Japan Working Paper Series are circulated in order to stimulate discussion and comments. Views expressed are those of authors and do not necessarily reflect those of the Bank.

If you have any comment or question on the working paper series, please contact each author.

When making a copy or reproduction of the content for commercial purposes, please contact the Public Relations Department (post.prd8@boj.or.jp) at the Bank in advance to request permission. When making a copy or reproduction, the source, Bank of Japan Working Paper Series, should explicitly be credited.

# Effects of Inflation and Wage Expectations on Consumer Spending: Evidence from Micro Data\*

Yuichiro Ito<sup>†</sup> and Sohei Kaihatsu<sup>‡</sup>

June, 2016

## Abstract

This paper employs a unique micro dataset in Japan to monitor inflation and wage expectations and investigate their effects on consumer spending. Based on our analysis, wage expectations increased moderately among wider range of employees after the introduction of Quantitative and Qualitative Monetary Easing (QQE). Real wage expectations also recovered recently, although it declined soon after the introduction of QQE, reflecting larger increases in inflation expectations compared with wage expectations. Increases in inflation expectations produced the positive effect on consumer spending on the whole since the positive effect of declines in real interest rates was larger than the negative effect of declines in real wage expectations. Wage expectations were generally influenced by wage perception and business performance outlook. This suggests that improvement in wage expectations needs to associate higher expectations about business performance outlook and realization of wage increases.

*JEL classification:* D12, D84, D91, E21, E52

*Keywords:* inflation expectations, wage expectations, Carlson–Parkin method, survey data, Quantitative and Qualitative Monetary Easing.

---

\* We would like to thank the staff of the Bank of Japan for their helpful comments. The data for this analysis, “The Questionnaire Survey on Work and Life of Workers (conducted by Japanese Trade Union Confederation Research Institute for Advancement of Living Standards),” was provided by the Social Science Japan Data Archive, Center for Social Research and Data Archives, Institute of Social Science, The University of Tokyo, and Japanese Trade Union Confederation Research Institute for Advancement of Living Standards. The views expressed here, as well as any remaining errors, are those of the authors and should not be ascribed to the Bank of Japan or the Monetary Affairs Department.

<sup>†</sup> Monetary Affairs Department, Bank of Japan (E-mail: yuuichirou.itou@boj.or.jp)

<sup>‡</sup> Monetary Affairs Department, Bank of Japan (E-mail: souhei.kaihatsu@boj.or.jp)

## 1. Introduction

Households make economic decisions on the basis of the outlook for inflation and wages as well as current economic conditions. Therefore, monitoring expectations regarding both inflation and wages is important for considering the effects of monetary policy on consumer spending as these reflect households' future outlook for the economy. Thus far, much effort has been devoted to characterizing the behavior of inflation expectations, using survey data.<sup>1</sup> However, only a few previous studies exist regarding empirical analyses on wage expectations partly due to data constraints.

Most researches among the available literature focus on the impact of inflation expectations on consumer spending. Ichiue and Nishiguchi (2015) find evidence to support the prediction that rising inflation expectations boost current spending at the zero lower bound on nominal interest rates; this relation appears to be stronger for asset holders and older people according to Japanese micro data from the "Opinion Survey on the General Public's Views and Behavior" conducted by the Bank of Japan. In Europe, D'Acunto et al. (2015) document a positive cross-sectional association between households' inflation expectations and their willingness to purchase durable consumption goods by exploiting the German natural experiment of an increase in value added tax. On the other hand, both Burke and Ozdagli (2013) and Bachmann et al. (2015) perform empirical analyses using US micro data. They report contradictory results about the effect of rising inflation expectations on current consumption of durable goods. Thus, no consensus has been reached regarding the relation between inflation expectations and consumer spending.

In this regard, Burke and Ozdagli (2013) report that households in their sample, on average, did not expect wage growth to match inflation; therefore, an increase in expected inflation would create a negative income effect that discouraged spending in both the present and future. This result indicates that when analyzing households' decisions about consumer spending, investigating the effect of wage expectations as well as the effect of inflation expectations is important. The effects of rising inflation expectations on consumer spending may vary depending on whether those expectations reflect an increase in commodity prices or a change in expectations caused by the monetary policy. Moreover, clarifying the impact of the relative relation between inflation and wage expectations on the real economy is important for assessing whether

---

<sup>1</sup> See Nishiguchi et al. (2014) and Kamada et al. (2015) for recent studies on households' inflation expectations in Japan.

rising inflation expectations lead to a virtuous cycle from income to spending.

The importance of measuring wage expectations has been broadly recognized. Bernanke (2007) remarks that measuring wage expectations provides useful information for monitoring households' inflation expectations although he indicates that data on wage expectations is particularly scarce.<sup>2</sup> Bruine de Bruin et al. (2010) indicate that wage expectations affect consumers' decisions across different periods and are thus of great value for understanding and forecasting economic behaviors. Moreover, Potter (2011) remarks that discrepancies between expected wage changes and expected inflation may affect household financial decisions. He emphasizes the importance of monitoring the relative relation between inflation and wage expectations.

This paper aims to investigate the effect of households' inflation expectations on their consumer spending, considering changes in wage expectations. It uses Japanese micro data from the "Questionnaire Survey on Work and Life of Workers" (hereafter the Workers Survey) conducted by Japanese Trade Union Confederation (RENGO) Research Institute for Advancement of Living Standards (hereafter RENGO-RIALS). There are three important contributions from our analysis.

First, this paper focuses on households' wage expectations, which have not yet been analyzed sufficiently due to data limitations, by employing unique micro data in Japan. We investigate the development of wage expectations and the relative relation between inflation and wage expectations after the introduction of quantitative and qualitative monetary easing (hereafter QQE) by the Bank of Japan. To the best of our knowledge, the Workers Survey is the only survey to have systematically collected data on households' forecasts for price, wage, and consumption for a long time period in Japan.

Second, this paper analyzes the effects of inflation expectations on the real economy through households' consumer spending, considering changes in wage expectations. The effects of rising inflation expectations on households' behaviors are likely to differ between the period of rising inflation expectations against the background of the commodity price surge in 2007–08 and the period after the introduction of QQE in 2013. This seems attributable to differences in households' sentiments, such as the outlook for economic conditions and business performance between these two periods. In this paper, we examine the conditions under which expectations of rising inflation stimulates

---

<sup>2</sup> Recognizing this problem, many countries have sought to start a new survey project. See Van der Klaauw et al. (2008) for details on the survey project in the US.

current consumer spending.

Third, this paper investigates how wage expectations are formed. We analyze the relation between wage expectations and responses given to other questions in the Workers Survey to examine the conditions under which wage expectations continue to rise steadily.

The remainder of this paper is organized as follows. Section 2 provides an overview of the survey data through a comparison with other household inquiries in Japan. Section 3 describes the modified Carlson–Parkin method in a pentachotomous case,<sup>3,4</sup> which is used as a quantification method of qualitative survey data. It investigates developments of inflation and wage expectations and their relative relation. Section 4 analyzes the effect of inflation expectations on consumer spending, considering changes in wage expectations. Section 5 investigates how wage expectations are formed. Section 6 presents the conclusion. The Appendix provides details of the modified Carlson–Parkin method in this paper.

## 2. Overview of survey data

In this paper, we construct a novel dataset combining household wage and inflation expectations together with the data on consumer spending based on the micro data from the Workers Survey conducted by RENGO-RIALS. Figure 1 illustrates an overview of the Workers Survey and compares it with other well-known household surveys, such as the “Opinion Survey on the General Public’s Views and Behavior” (conducted by the Bank of Japan) and the “Consumer Confidence Survey” (conducted by the Cabinet Office). The Workers Survey started in April 2001 and has been conducted semiannually to investigate workers’ outlook for economic and labor conditions. Until April 2010, responses had been obtained via the mail survey method, and since the 20th survey in October 2010, responses have been obtained via the Internet-monitor survey method. Since the introduction of the Internet-monitor survey method, the survey’s sample size has been 2,000 respondents, which is comparable to the other well-known household surveys.

The Workers Survey is conducted for individuals who work at private firms in the

---

<sup>3</sup> The term pentachotomous originates from the Greek word meaning “fivefold.”

<sup>4</sup> We extend the standard Carlson–Parkin method to deal with a questionnaire with five choices and modify it to adjust the survey data to deal with some distortions, as explained later.

Tokyo or Kansai metropolitan areas.<sup>5</sup> The survey differs from the “Opinion Survey on the General Public’s Views and Behavior” and “Consumer Confidence Survey,” both of which are conducted at the household level and include the retired and the unemployed. In addition, it is characteristic that the Workers Survey collects data on wage income, whereas the other household surveys investigate total household income. Here, careful attention should be paid to the point that total income includes pensions, asset income, and spousal income as well as wages. Moreover, the survey investigates a wide range of topics, such as perceptions and outlook toward price and consumption, which are likely to have a strong connection with wage expectations. Therefore, for example, it is possible to analyze the effect of inflation expectations on households’ consumer spending based on the same set of samples. To the best of our knowledge, the Workers Survey is the only survey in Japan to systematically collect data on households’ outlook regarding price, wages, and consumption for a long time period.<sup>6</sup>

It is also characteristic that the Workers Survey contains much information about respondents’ attributes regarding the firms in which they are employed and their employment formats. For example, the survey collects data on the number of employees in the employing firm, industry, presence of labor union, type of employment, and employment longevity. Therefore, it is possible to analyze the data by controlling for the effects of various attributes.<sup>7</sup> While we mainly analyze the outlook for price, wage, economic conditions, business performance, and consumption across the whole sample, we also perform our sub-sample analysis based on attributes, such as the number of employees in the employing firm, industry, and type of employment.

The survey inquires about price and wage changes from the previous year in questions. For example, the survey question about forecasts for price asks, “What is your outlook for price one year from now?” and the respondents are required to select from six choices: “will go up significantly,” “will go up slightly,” “will remain almost unchanged,” “will go down slightly,” “will go down significantly,” and “unknown.” In this paper, we remove the respondents who select “unknown” and analyze the data based on the respondents who selected the other five choices. Furthermore, the survey

---

<sup>5</sup> In the survey, respondents are randomly selected from registered private workers based on the Employment Status Survey.

<sup>6</sup> As a study based on the Workers Survey, Oguma and Nagumo (2011) investigate a development of anxiety about unemployment and the effect of the presence of a labor union on easing uncertainty about life.

<sup>7</sup> For details of respondents’ attributes in the survey, see the reference figure.

investigates forecasts covering three years from now in the questions of price, economic conditions, and business performance. In addition, it investigates forecasts for three and five years from now in the question on wages in April since 2013. Therefore, we analyze not only short-term expectations covering one year from now but also long-term expectations for three and five years from now.

### **3. Measuring wage expectations**

This section introduces methodology to estimate wage expectations. We then investigate the development of wage expectations in Japan amid expectations of rising inflation after the introduction of QQE by the Bank of Japan. For details of the estimation method, see the attached Appendix.

#### **a. Carlson–Parkin method in a pentachotomous case**

When analyzing household sentiments or expectations, which are thought to have useful information for conducting monetary policy, we face difficulty in how to measure such unobservable factors. Therefore, when measuring inflation expectations, we often utilize a method to calculate backward from an observable variable, such as a nominal interest rate, by linking it with inflation expectations based on the rational expectations hypothesis or by relying on surveys that directly collect data on inflation expectations.

Although many attempts have been made to extract household sentiments, such as inflation expectations from survey data, most survey questionnaires take a question form where respondents select from qualitative choices, such as “will go up” or “will go down,” instead of directly asking a quantitative answer.<sup>8</sup> Such qualitative survey responses have to be converted to quantitative data for our analysis. A typical way to quantify the qualitative survey data is the Carlson–Parkin method (Carlson and Parkin [1975]). This method assumes that the respondents select “go up” when their inflation expectations are higher than a specific upper threshold and select “go down” when the expectations are lower than a specific lower threshold (Figure 2). It also assumes that survey responses will follow a specific distribution, such as the normal distribution. We then estimate the thresholds on the condition that the average of the quantified data equals the average of the actual data and construct the quantified data using those parameter estimates.

---

<sup>8</sup> In the “Opinion Survey on the General Public’s Views and Behavior” and the “Consumer Confidence Survey,” some questions directly seek quantitative answers or use an answer format where respondents select from quantitative choices.

The original Carlson–Parkin method was derived for a trichotomous<sup>9</sup> survey about inflation expectations, where respondents are asked to select one of three choices, such as “go up,” “remain almost unchanged,” and “go down.” However, the Workers Survey is not a trichotomous but a pentachotomous survey; respondents are asked to select one of five choices, such as “go up significantly,” “go up slightly,” “remain almost unchanged,” “go down slightly,” and “go down significantly.” Although we can still apply the original Carlson–Parkin method to quantify pentachotomous survey data by ignoring the differences between “go up (down) significantly” and “go up (down) slightly,” it means that we lose some information included in pentachotomous survey responses.

Therefore, we employ the method of Batchelor and Orr (1988), which generalizes the original Carlson–Parkin method to deal with a pentachotomous survey. They apply this method to households’ outlook for prices from European Economic Community survey data in which survey respondents select one of five choices, such as “much higher,” “moderately higher,” “a little higher,” “about the same,” and “a little lower.”<sup>10</sup> Nielsen (2003) analyzes the inflation expectations in Europe based on this method. In this paper, we modify their method by considering the fact that the Workers Survey’s answer form is symmetric in up and down sides.

As shown in Figure 3, we assume that inflation expectations formed by survey respondents follow the normal distribution with mean  $\mu_t$  and standard deviation  $\sigma_t$ . We then suppose that respondents select “go up significantly/go up slightly/remain almost unchanged/go down slightly/go down significantly” depending on the thresholds, which are, respectively,  $\pi + \varepsilon_t < \mu_{it}$ ,  $\pi - \varepsilon_t < \mu_{it} < \pi + \varepsilon_t$ ,  $-\pi + \delta_t < \mu_{it} < \pi - \varepsilon_t$ ,  $-\pi - \delta_t < \mu_{it} < -\pi + \delta_t$ , or  $\mu_{it} < -\pi - \delta_t$ , where  $\mu_{it}$  is an inflation expectation held by respondent  $i$  at time  $t$ . For details of the modified Carlson–Parkin method in a pentachotomous case, see the attached Appendix (a).

## **b. Adjusting survey responses for distortions**

Although the Carlson–Parkin method is widely used to quantify qualitative survey data, several problems have been indicated. First, some empirical studies have questioned the validity of the assumption that survey responses follow a normal

---

<sup>9</sup> The term trichotomous originates from the Greek word for “threefold.”

<sup>10</sup> As a study of the Carlson–Parkin method in a pentachotomous case, Kano (2006) proposes an estimation method that uses the logistic function.



distribution. In this regard, as indicated by Kano (2006), it seems reasonable to assume the existence of a standard and tractable normal distribution in a situation where there is little information about distribution of expectations. We thus assume the normal distribution in this paper, but the estimates should be interpreted with some latitude.

Second, the assumption of constant and symmetric thresholds is also questioned since it is thought that distortions exist in survey responses. Based on data from the “Opinion Survey on the General Public’s Views and Behavior,” Kamada (2013) indicates the following distortions in household responses in Japan: there are too many integers, zeros, and multiples of five but too few negative values. He also reveals that the presence of many zeros and of few negative values suggests that many households give an answer of 0% even if they actually expect deflation, which implies that there exists downward rigidity in households’ answers on inflation expectations. If any distortions exist in survey responses, it is impossible to apply the original Carlson–Parkin method, which assumes the symmetric thresholds.

To deal with these distortions, it is necessary to relax the assumption of constant and symmetric thresholds as well as the long-term equality between perceived and expected values. In this regard, many studies propose methods to modify the original Carlson–Parkin method. Hori and Terai (2005) suggest an approach that allows for time variation in and asymmetry of thresholds by assuming the rational expectations hypothesis. Kano (2006) also proposes a method to allow for asymmetry of thresholds by supposing that the dispersion of survey responses equals that of the actual series. Furthermore, Sekine et al. (2008) obtain inflation expectations using the ordinary least squares method by assuming the existence of distortions in survey answers.

In addition to the distortions peculiar to survey responses about inflation expectations, other types of distortions exist regarding the use of mail survey or Internet-monitor survey methods. Honda and Honkawa (2005) mention that significant differences exist in survey responses between surveys using the mail survey and Internet-monitor survey methods. In particular, they indicate that negative responses, such as anxiety and complaints, tend to be observed more often in the Internet-monitor survey. These distortions must be considered to quantify qualitative data using the Carlson–Parkin method. In fact, the Workers Survey had been conducted via mail survey method until April 2010 and had been conducted via Internet-monitor survey method since October 2010. Recently, the Internet-monitor survey has become more popular, considering

increasing costs of post, the need for quick information gathering, and strict information management guidelines. Therefore, considering these factors has become important.<sup>11</sup>

Based on these points, we use the modified Carlson–Parkin method introduced by Sekine et al. (2008) to deal with potential distortions in survey responses (Figure 3). Mentioned above, a proposed method exists to adjust for distortions by assuming the rational expectations hypothesis. It is, however, inappropriate to place strong restrictions on the expectation-formation mechanism in our analysis because we intend to examine how wage and inflation expectations are formed. Other methods also exist to adjust for distortions in survey responses of inflation expectations by assuming equality between the dispersion of survey responses and the actual time series. This approach, however, seems inappropriate because heterogeneity of wage expectations is thought to be much larger than that of inflation expectations.

In contrast, the method proposed by Sekine et al. (2008) is sufficiently flexible to deal with the distortions arising from differences in survey methods. Details of the estimation are given in Appendix (B). In the following sections, we quantify the qualitative survey data on inflation and wage expectations in the Workers Survey using the modified Carlson–Parkin method in a pentachotomous case, described earlier.

### **c. Relative relation between inflation and wage expectations**

In this section, we examine inflation and wage expectations obtained by quantifying the qualitative survey data in the Workers Survey using the modified Carlson–Parkin method in a pentachotomous case. First, specifying quantitative reference indicators associated with the corresponding qualitative survey data is necessary. We select the consumer price index and total amount of per capita cash salary as reference indicators to quantify the survey data for price and wage developments, respectively. When selecting reference indicators, we considered whether to exclude the effects of the consumption tax hike from the consumer price index by comparing them with the diffusion index (DI) of survey responses for price developments. Similarly, we considered the indicators to be used—total amount of per capita cash salary or per hour cash salary—by comparing them with the DI of survey responses on wage (Figure 4).<sup>12</sup>

---

<sup>11</sup> Oguma and Nagumo (2011) investigate differences in the content of the responses between the mail survey method and the Internet-monitor survey method in the Workers Survey and find that there are significant differences even if they adjust for the distortions stemming from survey method.

<sup>12</sup> The Workers Survey makes no reference to treatment of consumer tax hikes in the question about prices. In addition, it is not distinguished whether it refers to an hourly wage or total amount of

As a result, we chose the consumer price index, excluding the effects of the consumption tax hike and total per capita cash salary amount as reference indicators of quantification. However, the survey's questions about prices do not strictly request respondents to exclude the effects of the consumption tax hike, and therefore, we cannot eliminate the possibility that the consumption tax hike influences the momentum of inflation perceptions and expectations. The estimates should thus be interpreted with some latitude. Similarly, when quantifying other variables, such as outlook for economic conditions and business performance, we set the reference indicators by comparing them with the corresponding DIs.<sup>13</sup>

### **Parameter estimates for the modified Carlson–Parkin method**

The estimated parameters for the modified Carlson–Parkin method in a pentachotomous case are shown in Figure 5. It indicates that dispersions for questions about wages, business performance, and consumption are larger than that for the question about price, reflecting the differences in potential distributions.<sup>14</sup> Furthermore, it indicates that both inflation perceptions and expectations have upward biases (i.e.,  $Z_1 < 0$  and  $Z_2 < 0$ ). Inflation expectations, in particular, have a larger bias than perceptions. On the other hand, the wage expectations have a large downward bias (i.e.,  $Z_1 > 0$  and  $Z_2 > 0$ ). As for the difference arising from survey methods, it is generally shown that the Internet-monitor survey method tends to have a larger downward bias than the mail survey method, and wage perceptions also have a clear downward bias in the Internet-monitor survey method (i.e.,  $Z_2 > 0$ ). These results are consistent with the analysis of Honda and Honkawa (2005), who indicate that Internet-monitor surveys tend to negatively influence survey responses.

### **Development of inflation and wage expectations**

We calculate inflation and wage expectations based on the estimated parameters

---

salary in the question on wages. We chose the total amount of cash salary including special earnings as a reference indicator because the development of wage perceptions and expectations in the survey are similar to that of the indicator.

<sup>13</sup> As for the outlook for economic conditions, business performance, and consumption, we set the growth rate of nominal GDP of the National Accounts, year-on-year rate of change in the current profits of Financial Statements Statistics of Corporations by industry, and growth rate of household final consumption of the National Accounts as corresponding reference indicators, respectively. In particular, we exclude the effects of the consumption tax hike on household final consumption.

<sup>14</sup> Note that questions about wages, business performance, and consumption ask for values specific to each survey respondent, whereas questions about prices ask in terms of common macroeconomic variables.

regarding thresholds and biases. Figure 6 illustrates that inflation expectations have significantly risen since the introduction of QQE in 2013 and subsequently stayed within the 0.5 to 1.0% range.<sup>15</sup> On the other hand, with regard to inflation perceptions, an upward trend has become remarkable since late 2013 although it is gentle compared with inflation expectations. In particular, inflation perceptions and expectations have maintained fairly positive values since late 2015 while the actual inflation rate of consumer prices has been around 0%. Furthermore, inflation expectations by worker attributes, such as the number of employees in the employing firm and employment formats, show no significant differences in characteristics after the introduction of QQE (Figure 7).

As shown in Figure 8, wage expectations have turned positive since the introduction of QQE and rose to around 0.5% from 2013 to 2015. In addition, an upward trend of wage perceptions has become remarkable recently although the upward shift is milder than that of wage expectations.

We estimate wage expectations by worker attributes, such as the number of employees in the employing firm, using the parameters estimated above. Wage expectations of workers who belong to relatively large firms (more than 300 employees) significantly increased after the introduction of QQE, whereas those for employees of small firms rose remarkably after 2014 (Figure 9). An analysis by employment format shows that wage expectations of regular employees increased just after the introduction of QQE, whereas those of non-regular employees gradually rose only recently. This development is consistent with the recognition that labor market conditions have recently become tight among non-regular employees. Examining the data by age shows that wage expectations of employees aged 40–50 rose significantly just after the introduction of QQE, whereas those of employees aged 20–30 increased remarkably after 2014. In addition, examining the data by industry indicates that wage expectations in construction and manufacturing sectors have increased significantly.

In sum, although the increase in wage expectations after the introduction of QQE was limited to only some workers, the number of workers who expect wages to rise has been steadily increasing as a whole since 2014. This indicates that a virtuous cycle from income to spending is likely to emerge.

---

<sup>15</sup> We confirm that the development of inflation expectations from the Workers Survey is not distinctly different from that indicated in the “Opinion Survey on the General Public’s Views and Behavior.”

## Relative relation between inflation and wage expectations

Since the introduction of QQE, both inflation and wage expectations have increased to some extent. What is the relative relation between those expectations? Burke and Ozdagli (2013) reveal that consumers, on average, did not expect their wage growth to match inflation, which would create a negative income effect that discourages spending in both the present and future. This implies that monitoring the relative relation between inflation and wage expectations is important.

In this section, we investigate the development of inflation and wage expectations, considering responses to other survey questions (Figure 10). First, when we compare the rising inflation period in 2007–08 and the period after the introduction of QQE, we found that wage expectations decreased in the former period but increased in the latter period. To understand the background, we investigate other survey questions, such as economic conditions, business performance, and wage perceptions in these two periods. We then found that those survey responses also improved after the introduction of QQE, whereas they were sluggish in the 2007–08 period. It is considered that the rise in inflation expectations in 2007–08 was caused by a commodity price surge in the same timeframe, with crude oil prices increasing. The effects of rising inflation expectations in response to cost-push shocks may differ from those of rising inflation expectations caused by a change in monetary policy, such as the introduction of QQE.

Furthermore, we analyze real wage perceptions and expectations by subtracting inflation rates from wages in nominal terms (Figure 11). The analysis indicates that real wage perceptions and expectations decreased to some extent just after the introduction of QQE because employees did not expect their wage perceptions and expectations to match inflation.<sup>16</sup> In this regard, as Burke and Ozdagli (2013) mentioned, a difference in the stickiness of inflation and wages may affect this result. However, because wage expectations have gradually increased recently, real wage expectations have also started to increase, and the deterioration of wage perceptions has eased. This development is in stark contrast with the fact that real wage expectations had decreased significantly in 2007–08.

---

<sup>16</sup> Attention should be given to the possibility that the consumption tax hike during the same period has some effects on this estimation.

## **4. Effect of inflation expectations on consumer spending**

### **a. Theoretical background**

In theory, the relation between inflation expectations and consumer spending depends on the relative size of two effects: intertemporal substitution effect and income effect (Figure 12). On one hand, with nominal interest rates constant, a rise in inflation expectations decreases real interest rates, which positively impacts consumer spending by the intertemporal substitution effect through an increase in the relative price of future goods. In contrast, a decline in inflation expectations negatively impacts consumer spending, which implies that people defer their consumption through the negative intertemporal substitution effect in a deepening deflation. Thus, in the process of overcoming deflation and rising inflation expectations, people are expected to convert their excessively deferred demand during the deflationary period into effective demand. On the other hand, a rise in inflation expectations lowers real wage expectations, which reduces consumer spending by the negative income effect, because it lowers expectations of real interest rate income through a decrease in real interest rates. In short, the issue of which effect dominates the other is an empirical matter.

As mentioned above, previous research in Japan (Ichiue and Nishiguchi [2015]) indicates that expectations of a rise in inflation stimulates consumer spending. In contrast, empirical studies in the US (Burke and Ozdagli [2013], Bachmann et al. [2015]) show no significant relation between inflation expectations and consumer spending. Interestingly, recent studies in the US indicate that households, on average, did not expect their wage growth to match inflation. If this is the case, rising inflation expectations negatively impact the outlook for real income, which may decrease consumer spending through the negative income effect.

This section examines the relation between inflation expectations and consumer spending in Japan, considering changes in wage expectations. We focus on the rising inflation period in 2007–08 and the period after the introduction of QQE.

### **b. Estimation model and empirical results**

To examine the relation between inflation expectations and consumer spending, we construct a panel dataset that is age-stratified by five years and quantify qualitative survey data on perceptions and expectations of inflation, wages, and consumption for every age stratum, using the modified Carlson–Parkin method in a pentachotomous

case.<sup>17</sup> We obtain perceptions and expectations for both real wages and real consumption, which are adjusted for inflation perceptions and expectations, respectively. We then conduct a panel analysis based on the age-stratified data using perceptions of real consumption as a dependent variable and real interest rates, real wage perceptions, and expectations as explanatory variables. Here, real wage perceptions proxy for recent development of actual wages. In this estimation, we consider several models with different lag structures and control for the age groups.

For each model, the signs of the regression coefficients are consistent with our expectations, and the estimation result indicates that lowering real interest rates increases perceptions of real consumption (Figure 13). This empirical result indicates that rising inflation expectations positively impact consumer spending through a decrease in real interest rates, with constant nominal interest rates.

As mentioned in studies for the US, however, rising inflation expectations may negatively impact consumer spending when a rise in wage expectations does not catch up with that of inflation expectations; as a result, real wage expectations decrease. In this regard, we examine the background to the development of perceptions of real consumption in both the rising inflation period of 2007–08 and the period after the introduction of QQE (Figure 14). As for the 2007–08 period, the negative effects of declining real wage expectations are larger than the positive effect of falling real interest rates; as a result, a rise in inflation expectations reduces consumer spending after all. On the other hand, the positive effect of falling real interest rates dominates the negative effect of lowering real wage expectations after the introduction of QQE, and as a result, the rise in inflation expectations stimulates consumer spending on the whole.

Reflecting these results, it is thought that whether a rise in inflation expectations with low and stable nominal interest rates will positively impact consumer spending depends on the relative relation between inflation and wage expectations, which may vary over time. We then examine the development of real consumption after the introduction of QQE. The analysis reveals that a decline in real wages has been limited, reflecting a mild increase in wage expectations even under rising inflation expectations. Therefore, a rise in inflation expectations after the introduction of QQE positively impacts

---

<sup>17</sup> It is appropriate to select the reference indicators for the corresponding age groups respectively. However, due to data limitations, we select the reference indicators which are used in the full sample estimation (i.e., consumer price index, total amount of cash salary, and household final consumption).

consumption on the whole. This result enables us to conjecture that households have gradually converted their excessively deferred demand during deflation into effective demand through the positive intertemporal substitution effect.

The analysis also shows that real wage perceptions have persistently depressed consumption over the period of interest. In the next section, we investigate the relation between wage perceptions and expectations.

## 5. Formation mechanism of wage expectations

### a. Framework of analysis

As mentioned in the previous section, rising inflation expectations positively impact consumer spending when both wage and inflation expectations increase in a balanced way. Here, the question is what determines wage expectations? In this section, we perform an empirical analysis using the data from the Workers Survey to answer this question.

Specifically, we conduct a panel data analysis using wage expectations as a dependent variable with other indexes obtained from the Workers Survey, such as perceptions and expectations of inflation, wages, economic conditions, and business performance, as explanatory variables. In the analysis, we use the ordered probit model, which is widely used to analyze qualitative data. Specifically, we estimate the following ordered probit model:

$$y_i^* = \alpha X_i + \varepsilon_i \quad y_i = \begin{cases} \text{will go up significantly} & \text{if } y_i^* \leq \beta_1 \\ \text{will go up slightly} & \text{if } \beta_1 < y_i^* \leq \beta_2 \\ \text{will remain almost unchanged} & \text{if } \beta_2 < y_i^* \leq \beta_3 \\ \text{will go down slightly} & \text{if } \beta_3 < y_i^* \leq \beta_4 \\ \text{will go down significantly} & \text{if } \beta_4 < y_i^* \end{cases}$$

Where  $y_i^*$  is a potential variable of respondents  $i$  regarding wage expectations; and  $X_i$  is a vector of explanatory variables, with cut-off parameters  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ , and  $\beta_4$ , which discriminate between  $y_i^*$  and the discrete observable responses of wage expectations. The ordered probit model enables us to analyze the relation between the qualitative response of wage expectations and other qualitative factors. In the estimation, we control for attributes, such as the number of employees in the employing firm, age, employment formats, and survey period.



## **b. Empirical results**

### **Mechanism through which wage expectations are formed**

First, we estimate the ordered probit model using wage expectations for one year from now as a dependent variable. In the estimation, we examine several specifications as shown in Figure 15.<sup>18</sup> The estimation results indicate that wage expectations are significantly affected by perceptions of wages and economic conditions, outlook for economic conditions, and business performance in all specifications.<sup>19</sup> In particular, coefficient size tells us that both wage perceptions and outlook for business performance significantly impact wage expectations. This indicates that wage expectations are formed in both a forward-looking and backward-looking manner. On the other hand, the effect of inflation perceptions is modest in the sense that statistical significance is obtained only for part of the specifications,<sup>20</sup> with the coefficients smaller than those on wage perceptions and outlook for business performance.

In summary, a rise in wage expectations necessitates an increase in actual wages and an improvement in business performance outlook. In the face of rising inflation in 2007–08, wage expectations did not increase in circumstances where the outlook for economic conditions and business performance failed to improve. An increase in actual wages is important for wage expectations to rise significantly in tandem with inflation expectations.

Next, we turn to wage expectations for three and five years from now. Figure 16 shows that they are significantly affected by outlook for economic conditions and business performance as well as by wage perceptions, which is consistent with the estimation result for wage expectations for one year from now. Considering the coefficient sizes in detail, wage perceptions and economic conditions seems less effective, whereas long-term outlooks for economic conditions and business performance seem more effective, compared with the case of wage expectations for one year from now. This result indicates that an improvement in forward-looking factors,

---

<sup>18</sup> The Workers Survey started collecting long-term data in April 2013. This long-term data includes the three-year outlook for inflation, economic conditions, and business performance as well as three- and five-year outlook for wages.

<sup>19</sup> In the estimation, we control for attributes such as the number of employees in the employing firm, age, employment formats, and survey period, using dummy variables.

<sup>20</sup> The result is consistent with the fact that the development of current inflation is taken into account in the wage-setting process between employees and employers in Japan.

such as wage expectations and outlook for business performance, is important for long-term wage expectations to rise.

### **Characteristics observed for workers' attributes**

Do determinants of wage expectations differ according to worker attributes? Intuitively, regular employees are thought to form wage expectations differently from non-regular employees due to differences in their respective payroll systems.

In this section, we analyze the effects of workers' attributes, such as employment formats and presence of labor unions, on wage expectations by adding interaction terms into the ordered probit model as independent variables. As for employment formats, for example, we construct dummy variables that take the value of unity for regular employees and zero otherwise. We then construct interaction terms by multiplying all independent variables in the probit model by the corresponding dummy variables. Examining the estimated coefficients on the interaction terms enables us to investigate the effects of employment format on wage expectations.<sup>21</sup>

Figure 17 shows the interaction terms of employment formats, indicating that wage expectations of regular employees are more significantly affected by wage perceptions than those of non-regular employees. This result may imply that regular employees tend to expect their wages to be stable over time, reflecting their perceptions of greater job security than non-regular workers.

Next, we investigate the effect of the presence of labor unions on wage expectations (Figure 18). The analysis reveals that employees who work at firms with a labor union significantly tend to expect higher wages when they hold a good business performance outlook. This result indicates the possibility that workers who work for firms with a labor union have a tendency to expect their wages to increase through labor unions' negotiating power when perceiving improvements in business performance.

## **6. Conclusion**

This paper uses micro data from the Workers Survey conducted by RENG0-RIALS to investigate the effects of inflation expectations on consumer spending, considering changes in wage expectations.

---

<sup>21</sup> In this section, we analyze workers working at large firms with more than 100 employees in order to control for firm size.

In the analysis, we use the modified Carlson–Parkin method in a pentachotomous case to deal with five-choice questionnaires and potential distortions of survey responses in the Workers Survey. We then quantify qualitative survey data on inflation and wage expectations. The estimation result reveals that wage expectations have moderately risen since the introduction of QQE. In particular, the number of workers who expect wages to rise has been steadily increasing as a whole since 2014, which indicates that a virtuous cycle from income to spending is likely to emerge.

Furthermore, we analyze the effect of expectations of rising inflation on consumer spending after the introduction of QQE, considering changes in wage expectations. The estimation result shows that the positive effect of falling real interest rates on consumer spending is larger than the negative effect of a decline in real wage expectations after the introduction of QQE; as a result, a rise in inflation expectations stimulates consumer spending.

Then, we used the ordered probit model to analyze the relation between wage expectations and other survey responses to investigate the mechanism through which wage expectations are formed. The result indicates that wage expectations are strongly influenced by wage perceptions and outlook for business performance, implying that an improvement in forward-looking factors, such as wage expectations and business performance outlook, is important for long-term wage expectations to rise.

Finally, attention should be given to the limitations of the analysis presented above. This paper employs the Carlson–Parkin method to measure inflation and wage expectations. The Carlson–Parkin method requires several strong assumptions regarding the shape of the respondents’ distribution, constancy of thresholds, and long-term equality between perceived and expected values, in addition to the selection of reference indicators. Therefore, some errors may arise in the estimation of inflation and wage expectations. It is also possible that we failed to control for the effects of a consumption tax hike on the estimation due to data constraints. With these considerations, we would like to emphasize that all the estimates given in this paper should be interpreted with some latitude.

## Appendix. Estimation method of inflation and wage expectations

### a. Carlson–Parkin method in a pentachotomous case

First, we show the Carlson–Parkin method in a pentachotomous case, which can be applied to a survey with five symmetric choices, by modifying the method of Batchelor and Orr (1988).

Specifically, we show an example of the quantification of inflation expectations. Figure 3 (1) illustrates a distribution of inflation expectations. This distribution is supposed to be formed by survey respondents. Here, we assume a normal distribution with mean  $\mu_t$  and standard deviation  $\sigma_t$ . In other words, we can specify the distributions of survey responses by obtaining  $\mu_t$  and  $\sigma_t$ .

The respondents select five choices such as “will go up significantly,” “will go up slightly,” “will remain almost unchanged,” “will go down slightly,” and “will go down significantly” to answer question about future prices. We then suppose that respondents select “go up significantly/go up slightly/remain almost unchanged/go down slightly/go down significantly” depending on the thresholds, which are, respectively,  $\pi + \varepsilon_t < \mu_{it}$ ,  $\pi - \varepsilon_t < \mu_{it} < \pi + \varepsilon_t$ ,  $-\pi + \delta_t < \mu_{it} < \pi - \varepsilon_t$ ,  $-\pi - \delta_t < \mu_{it} < -\pi + \delta_t$ , or  $\mu_{it} < -\pi - \delta_t$ , where  $\mu_{it}$  is a inflation expectation of a respondent  $i$  at time  $t$ .

We define  $A_t$  as the ratio of “will go down significantly,”  $B_t$  as the ratio of “will go down slightly,”  $C_t$  as the ratio of “will remain almost unchanged,” and  $D_t$  as the ratio of “will go up slightly.” Then we can specify the following relations:

$$A_t = \Phi\left(\frac{-\mu_t - \pi - \delta_t}{\sigma_t}\right) \quad (1)$$

$$A_t + B_t = \Phi\left(\frac{-\mu_t - \pi + \delta_t}{\sigma_t}\right) \quad (2)$$

$$A_t + B_t + C_t = \Phi\left(\frac{-\mu_t + \pi - \varepsilon_t}{\sigma_t}\right) \quad (3)$$

$$A_t + B_t + C_t + D_t = \Phi\left(\frac{-\mu_t + \pi + \varepsilon_t}{\sigma_t}\right) \quad (4)$$

where  $\Phi(\bullet)$  is a cumulative distribution function of a standard normal distribution. Define four variables  $a_t$ ,  $b_t$ ,  $c_t$ , and  $d_t$  as follows,

$$a_t = \Phi^{-1}(A_t) = \frac{-\mu_t - \pi - \delta_t}{\sigma_t} \quad (5)$$

$$b_t = \Phi^{-1}(A_t + B_t) = \frac{-\mu_t - \pi + \delta_t}{\sigma_t} \quad (6)$$

$$c_t = \Phi^{-1}(A_t + B_t + C_t) = \frac{-\mu_t + \pi - \varepsilon_t}{\sigma_t} \quad (7)$$

$$d_t = \Phi^{-1}(A_t + B_t + C_t + D_t) = \frac{-\mu_t + \pi + \varepsilon_t}{\sigma_t} \quad (8)$$

Then, we can denote  $\mu_t$ ,  $\sigma_t$ ,  $\delta_t$ , and  $\varepsilon_t$  as follows, using equations (5) to (8)

$$\mu_t = (a_t + b_t + c_t + d_t)q_t\pi \quad (9)$$

$$\sigma_t = -4q_t\pi \quad (10)$$

$$\delta_t = (3a_t - b_t - c_t - d_t)q_t\pi - \pi \quad (11)$$

$$\varepsilon_t = 2(c_t - d_t)q_t\pi \quad (12)$$

where  $q_t^{-1} = a_t + b_t - c_t - d_t$ . We can calculate  $a_t$ ,  $b_t$ ,  $c_t$ , and  $d_t$ , using survey data. Then, we suppose the following equation to estimate  $\pi$

$$\sum_t \mu_t = \sum_t x_t \quad (13)$$

$$\sum_t (a_t + b_t + c_t + d_t)q_t\pi = \sum_t x_t \quad (14)$$

where  $x_t$  is the actual inflation rate at time  $t$ , which is specified as a reference indicator. We suppose that averages of inflation expectations are equal to those of actual inflation. We can estimate the threshold  $\pi$  from equation (14) as follows.

$$\pi = \frac{\sum_t x_t}{\sum_t (a_t + b_t + c_t + d_t) q_t} \quad (15)$$

Then, we can specify the average  $\mu_t$  and standard error  $\sigma_t$  by putting the threshold  $\pi$  into equations (9) and (10).

## b. Method to eliminate distortions

Survey answers are likely to suffer from distortions, such as downward rigidity in inflation expectations and a bias peculiar to the specific investigation method, such as the Internet-monitor survey. These distortions prevent us from applying the Carlson–Parkin method to the survey data because the method assumes a symmetric threshold without any distortion.

For the purpose of adjusting for these distortions, it is necessary to loosen several assumptions: the constant and symmetric thresholds and long-term equality between perceived and expected values. In this paper, we modify the Carlson–Parkin method in a pentachotomous case shown in Appendix (A) based on the approach by Sekine et al. (2008), in which they calculate inflation expectations using the ordinary least squares method by assuming the existence of distortions in survey answers.

Specifically, we assume that inflation expectations are distorted from the actual inflation rate  $x_t$  in the Workers Survey by modifying equation (13);

$$\sum_t (\mu_t + z_{1,t} + z_{2,t}) = \sum_t x_t \quad (16)$$

$$\sum_t [(a_t + b_t + c_t + d_t) q_t \pi + z_{1,t} + z_{2,t}] = \sum_t x_t \quad (17)$$

where,  $Z_{1,t}$  is a bias peculiar to the mail survey method;  $Z_{1,t}$  takes constant value in the case of the mail survey method and is zero otherwise.<sup>22</sup> On the other hand,  $Z_{2,t}$  is a bias peculiar to the Internet-monitor method;  $Z_{2,t}$  takes a constant value in the case of the Internet-monitor method and zero otherwise. A positive value of these bias terms

---

<sup>22</sup> For simplicity, we suppose here that the biases are constant over the survey period, although such a constancy is arguable in fact.

implies a downward bias in the survey, whereas a negative value indicates an upward bias.

Equation (17) indicates the assumption that the sum of actual inflation corresponds to the sum of inflation expectations obtained by the survey data and bias terms. Note that we cannot calculate the threshold  $\pi$ , or biases  $Z_{1,t}$  and  $Z_{2,t}$  from equation (17). Therefore, we further assume the following condition:

$$\hat{\pi} = \arg \min_{\pi} \sum_t [x_t - (a_t + b_t + c_t + d_t)q_t\pi - z_{1,t} - z_{2,t}]^2 \quad (18)$$

This condition implies that  $\hat{\pi}$  is determined to minimize the squared sum of deviation between actual inflation rates and inflation expectations adjusted for the bias. This is equivalent to estimating the threshold  $\pi$  and biases  $Z_{1,t}$  and  $Z_{2,t}$  based on the following least-squares regression model:

$$x_t = (a_t + b_t + c_t + d_t)q_t\pi + z_{1,t} + z_{2,t} + u_t \quad (19)$$

where  $u_t$  is an error term.

## References

- Bachmann, R., Tim O. Berg, and Eric R. Sims, “Inflation Expectations and Readiness to Spend: Cross-Sectional Evidence,” *Economic Policy*, vol. 7 No. 1, 2015, pp. 1–35.
- Batchelor, R. A. and A. B. Orr, “Inflation Expectations Revisited,” *Economica*, vol. 55 No. 219, 1988, pp. 317-331.
- Bernanke, Ben S., “Inflation Expectations and Inflation Forecasting,” Speech at the Monetary Economics Workshop of the National Bureau of Economic Research Summer Institute, Cambridge, Massachusetts, July 10, 2007.
- Bruine de Bruin, W., S. Potter, R. Rich, G. Topa and W. van der Klaauw, “Improving Survey Measures of Household Inflation Expectations,” *Current Issues in Economics and Finance*, Vol. 16 No. 7, Aug/Sept 2010.
- Burke, M. A. and A. K. Ozdagli, “Household Inflation Expectations and Consumer Spending: Evidence from Panel Data.” Working Paper No. 13-25, Federal Reserve Bank of Boston, 2013.
- Carlson, J. A. and M. Parkin, “Inflation Expectation,” *Economica*, vol. 42, 1975, pp. 123-138.
- D’Acunto, F., D. Hoang, and M. Weber, “Inflation Expectations and Consumption Expenditure,” Working paper, Chicago Booth Global Markets, 2015.
- Honda, N. and A. Honkawa, “*Internet chousa ha syakai chousa ni riyou dekiru ka* (Can We Use an Internet Survey in the Social Study?),” *Roudouseisaku kenkyu houkokusyo*, No. 17, roudou seisaku kenkyu kenshu kikou, 2005, in Japanese.
- Hori, M. and A. Terai, “*Carlson-Parkin hou niyoru infure kitai no keisoku to syomondai* (Measurement of Inflation Expectations by the Carlson–Parkin Method and Its Problems),” *Keizaibunseki*, No. 175, pp. 167-173, 2005, in Japanese.
- Ichiiue, H. and S. Nishiguchi, “Inflation Expectations and Consumer Spending at the Zero Bound: Micro Evidence,” *Economic Inquiry*, Vol. 53 No. 2, 2015, pp. 1086–1107.
- Kamada, K., “Downward Rigidity in Households’ Price Expectations: An analysis Based on the Bank of Japan’s ‘Opinion Survey on the General Public’s Views and



- Behavior””, Bank of Japan Working Paper Series, No. 13-E-15, 2013.
- Kamada, K., J. Nakajima and S. Nishiguchi, “Are Household Inflation Expectations Anchored in Japan?” Bank of Japan Working Paper Series, No. 15-E-8, 2015.
- Kano, S., “*Macro keizai bunseki to survey data* (Macroeconomic Analysis Using Survey Data)”, Iwanami shoten, 2006, in Japanese.
- Nielsen, H., “Inflation Expectations in the EU: Results from Survey Data,” Discussion papers of interdisciplinary research project 373, No. 13, 2003.
- Nishiguchi, S., J. Nakajima, and K. Imakubo, “Disagreement in Households’ Inflation Expectations and Its Evolution,” Bank of Japan Review Series, No. 14-E-1, 2014.
- Oguma, S. and C. Nagumo, “*Shakai-chousa ni okeru internet-monitor chousa to yusou-monitor chousa tono hikaku* (Comparison of Internet-Monitor Survey Method and Mail Survey Method in Social Survey),” Rengo souken report No. 258, pp. 20-27, Rengo souken, 2011, in Japanese.
- Oguma, S. and C. Nagumo, “*Kinrousha ga kakaeru shitsugyou to seikatsu no fuan* (Fear of Job Loss and Poverty among Workers),” Nihon roudou kenkyu zashi, No. 612, pp. 29-39, 2011, in Japanese.
- Potter, S., “Improving Survey Measures of Inflation Expectations,” Speech at Forecasters Club of New York, March 30, 2011.
- Sekine, T., K. Yoshimura, and C. Wada, “Infureyosou ni tsuite (Inflation Expectations),” Bank of Japan Review Series, No. 08-J-15, 2008, in Japanese.
- Van der Klaauw, W., W. Bruine de Bruin, G. Topa, S. Potter, and M. F. Bryan, “Rethinking the Measurement of Household Inflation Expectations: Preliminary Findings,” Federal Reserve Bank of New York Staff Report, No. 359, 2008.

(Figure 1)

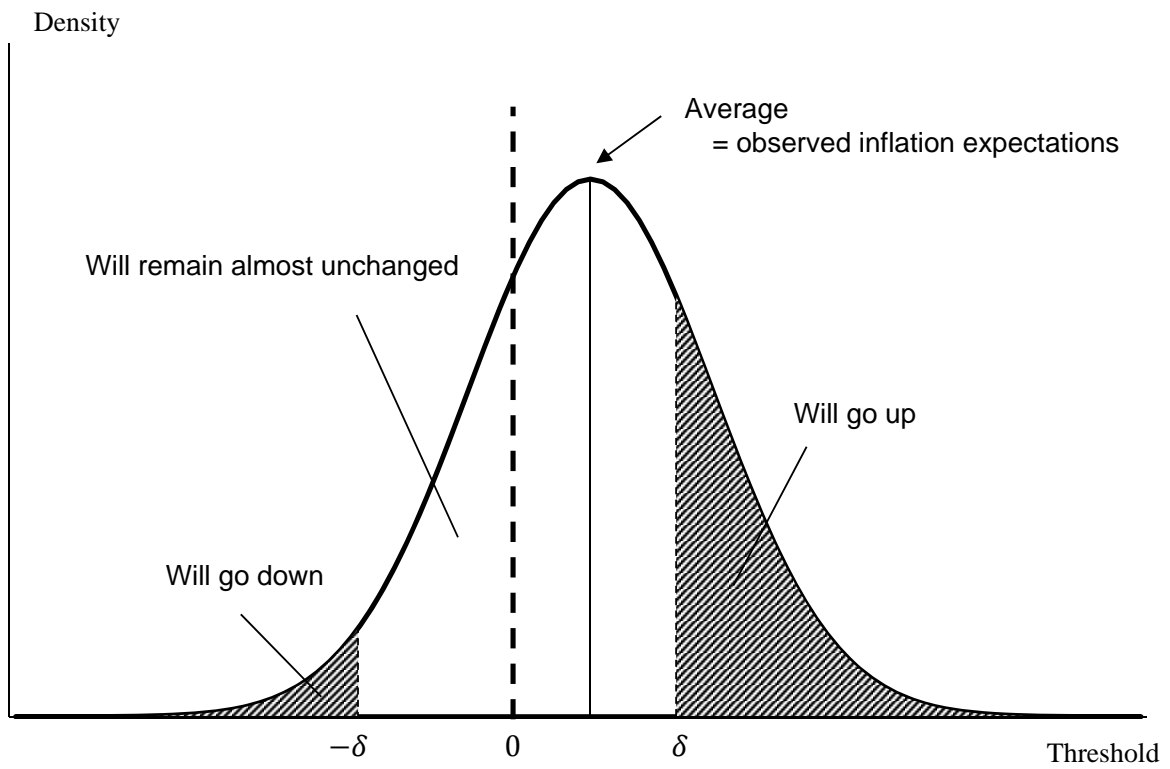
## Details of Workers Survey

	<b>Workers Survey</b>	Opinion Survey on the General Public's Views and Behavior	Consumer Confidence Survey
Survey Conductor	<b>RENGO-RIALS</b>	Bank of Japan	Cabinet Office
Target	<b>People working in private firms (in Tokyo or Kansai metropolitan area)</b>	Individuals who are at least 20 years of age	Households of two or more persons/one- person households
Population (Statistics to be Based on)	<b>Workers (on the Employment Status Survey)</b>	Households (on the Resident Registration System)	Households (on the Population Census)
Sample Size	<b>2,000 (in Oct. 2015)</b>	2,122 (in Dec. 2015)	5,493 (in Dec. 2015)
Starting Year of the Survey	<b>2001</b>	1993	1957
Frequency	<b>Semi-annually (in April/October)</b>	Quarterly	Monthly
Questionnaire on Income	<b>Wage (present) Wage (next year) Household income (present) Household income (next year)</b>	Household income (present) Household income (next year)	Household income (six months later)
Workers' Attributes	<b>Industry, employment formats, the number of employees, occupation, the length of service, presence of labor union, etc.</b>	Occupation (full-time or part-time, etc.)	Occupation (farmer or worker, etc.)
Individuals' Attributes	<b>Sex, age, income, education, marital status, region, etc.</b>	Sex, age, income, family type, region, etc.	Sex, age, income, region, scale city, etc.
Other Questionnaire	<b>Economy, business performance, price, a circumstance of life, consumption expenditure, etc.</b>	Business confidence, a circumstance of life, expenditure, price, land price, recognition of BOJ's objectives, etc.	A circumstance of life, willingness to buy durable goods, price, etc.

Sources: Cabinet Office, "Consumer Confidence Survey"; RENGO-RIALS, "The Questionnaire Survey on Work and Life of Workers"; BOJ, "Opinion Survey on the General Public's Views and Behavior."

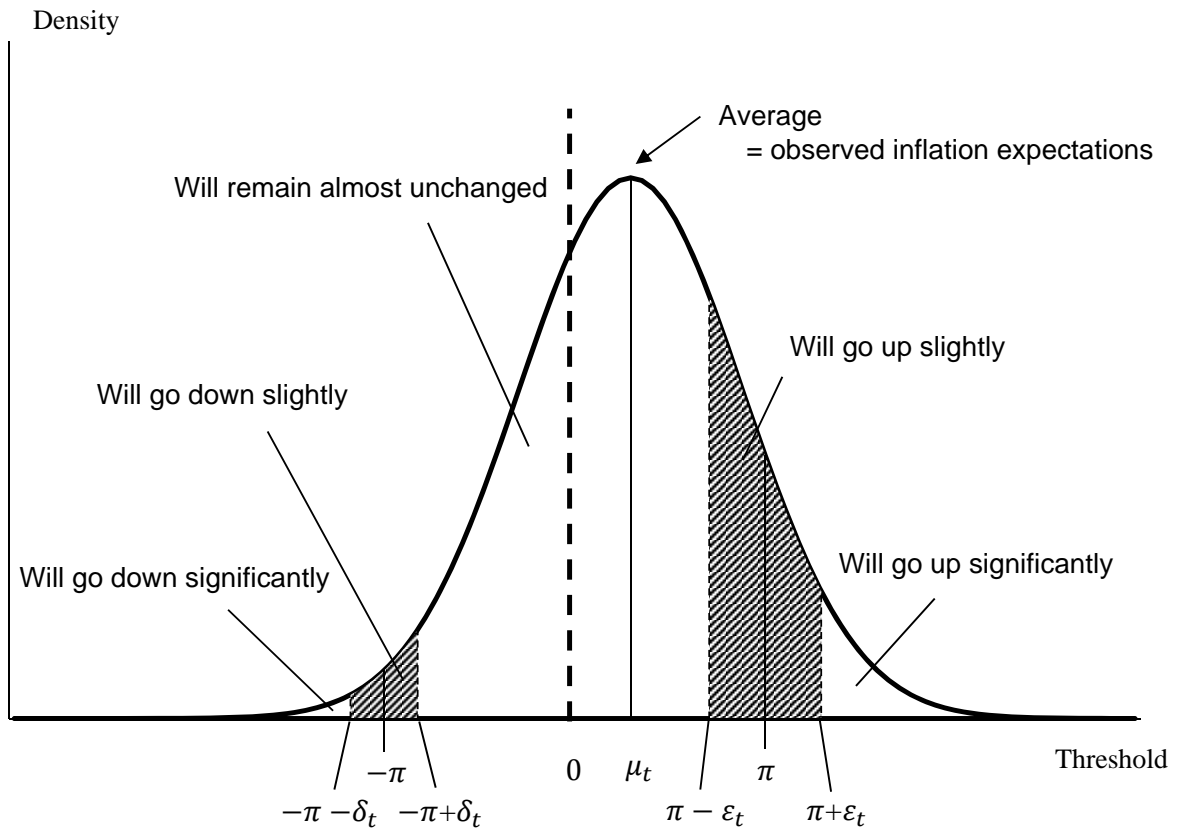
## Carlson-Parkin Method (Conceptual Diagram)

(1) Carlson-Parkin method (Conceptual diagram)



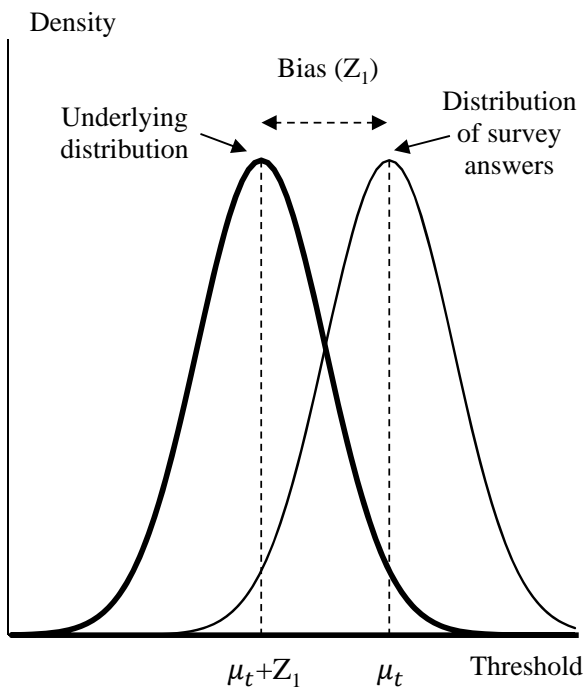
## Modified Carlson-Parkin Method in a Pentachotomous Case

(1) Underlying distribution in the Carlson-Parkin method in a pentachotomous case

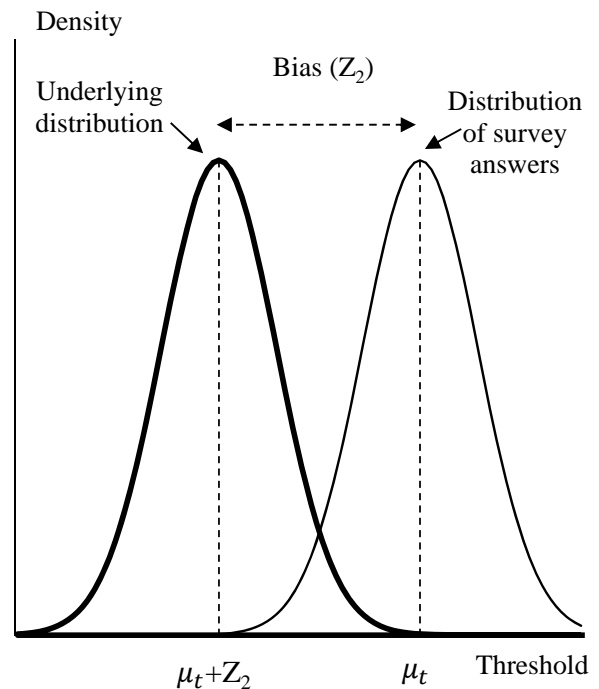


(2) Adjustment for biases

a. The mail survey method



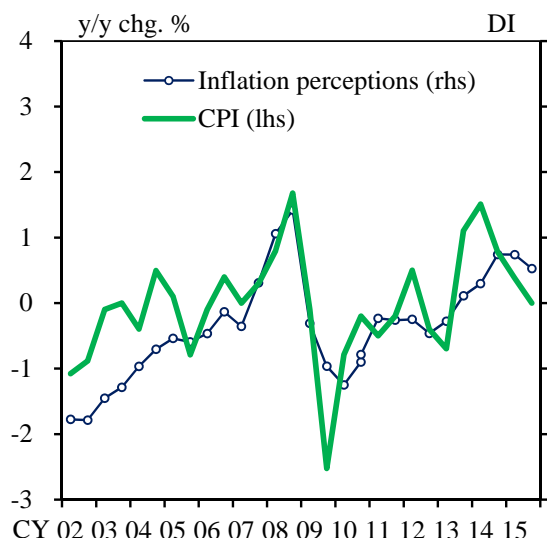
b. The Internet-monitor survey method



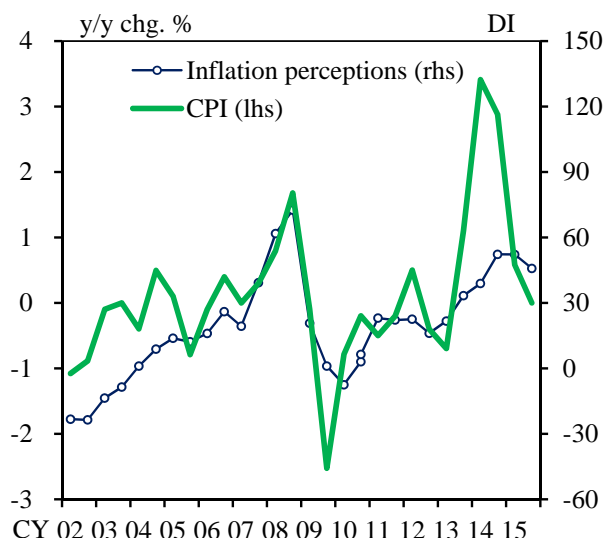
## Responses to Questions of Prices, Wages, and Reference Indicators

### (1) Responses to questions of price and consumer price index

#### a. Consumer Price Index (excluding the effects of consumption tax hikes)



#### b. Consumer Price Index (including the effects of consumption tax hikes)



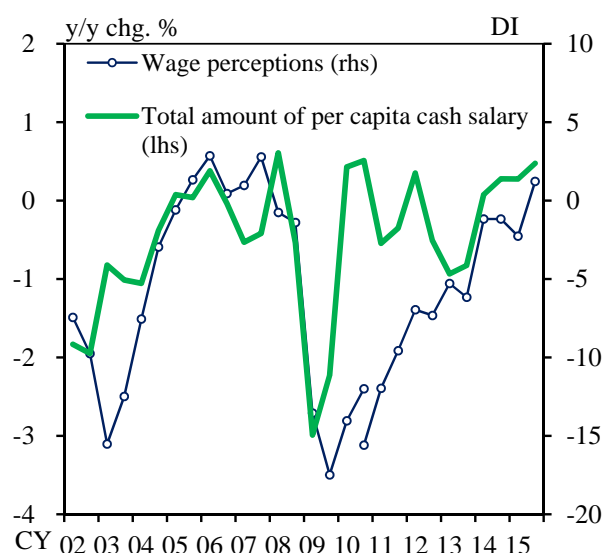
Notes: 1. DI = (percentage of respondents selecting “will go up significantly” + percentage of respondents selecting “will go up slightly” \* 0.5 – percentage of respondents selecting “will go down slightly” \* 0.5 – percentage of respondents selecting “will go down significantly.”)

2. The Workers Survey used the mail-method through April 2010 and the Internet-method thereafter.

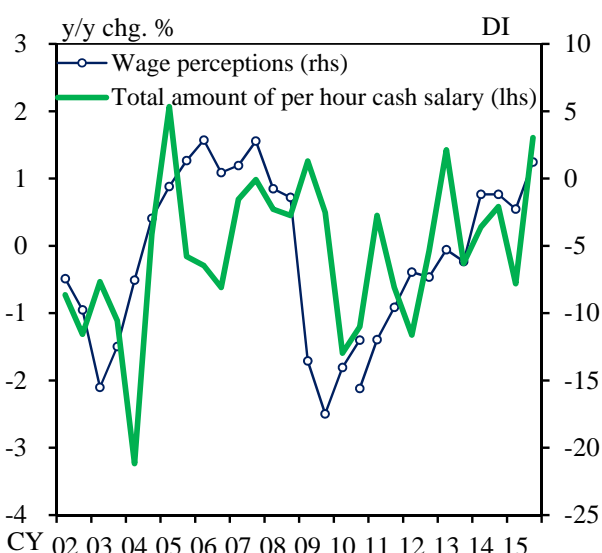
3. The consumer price index excluding the effects of consumption tax hikes is estimated by the Research and Statistics Department, Bank of Japan.

### (2) Responses to questions of wages and total sum of cash earnings

#### a. Total amount of per capita cash salary



#### b. Total amount of per hour cash salary



Notes: 1. DI = (percentage of respondents selecting “will increase significantly” + percentage of respondents selecting “will increase slightly” \* 0.5 – percentage of respondents selecting “will decrease slightly” \* 0.5 – percentage of respondents selecting “will decrease significantly.”)

2. The Workers Survey used the mail-method through April 2010 and the Internet-method thereafter.

Sources: Ministry of Health, Labour and Welfare, “Monthly Labour Survey”; Ministry of Internal Affairs and Communications, “Consumer Price Index”; RENGO-RIALS, “The Questionnaire Survey on Work and Life of Workers.”

## Estimations of Modified Carlson-Parkin Method

### (1) Estimated parameters

		Modified Carlson-Parkin method					
		Threshold (%)			Dispersion (%)	Bias (%)	
		$\pi$	$\delta$	$\varepsilon$	$\sigma$	$Z_1$	$Z_2$
Prices	Perceived inflation (compared with one year ago)	1.01	0.42	0.58	0.76	-0.48	-0.38
	Inflation expectations (one year from now)	1.52	0.60	0.94	1.11	-0.88	-0.94
Wages	Perceived wage (compared with one year ago)	3.70	1.23	2.25	3.26	-0.08	0.58
	Wage expectations (one year from now)	7.79	2.45	4.34	5.76	0.97	1.66
Economic Conditions	Perceptions (compared with one year ago)	2.91	0.94	1.68	2.23	0.85	1.97
	Expectations (one year from now)	4.54	1.55	2.80	3.56	0.27	2.34
Business Performance	Perceptions (compared with one year ago)	5.44	2.35	2.73	4.83	1.54	3.32
	Expectations (one year from now)	15.13	5.88	8.12	12.15	3.21	5.64
Consumption	Perceptions (compared with one year ago)	5.44	2.21	2.65	4.67	-0.82	0.57

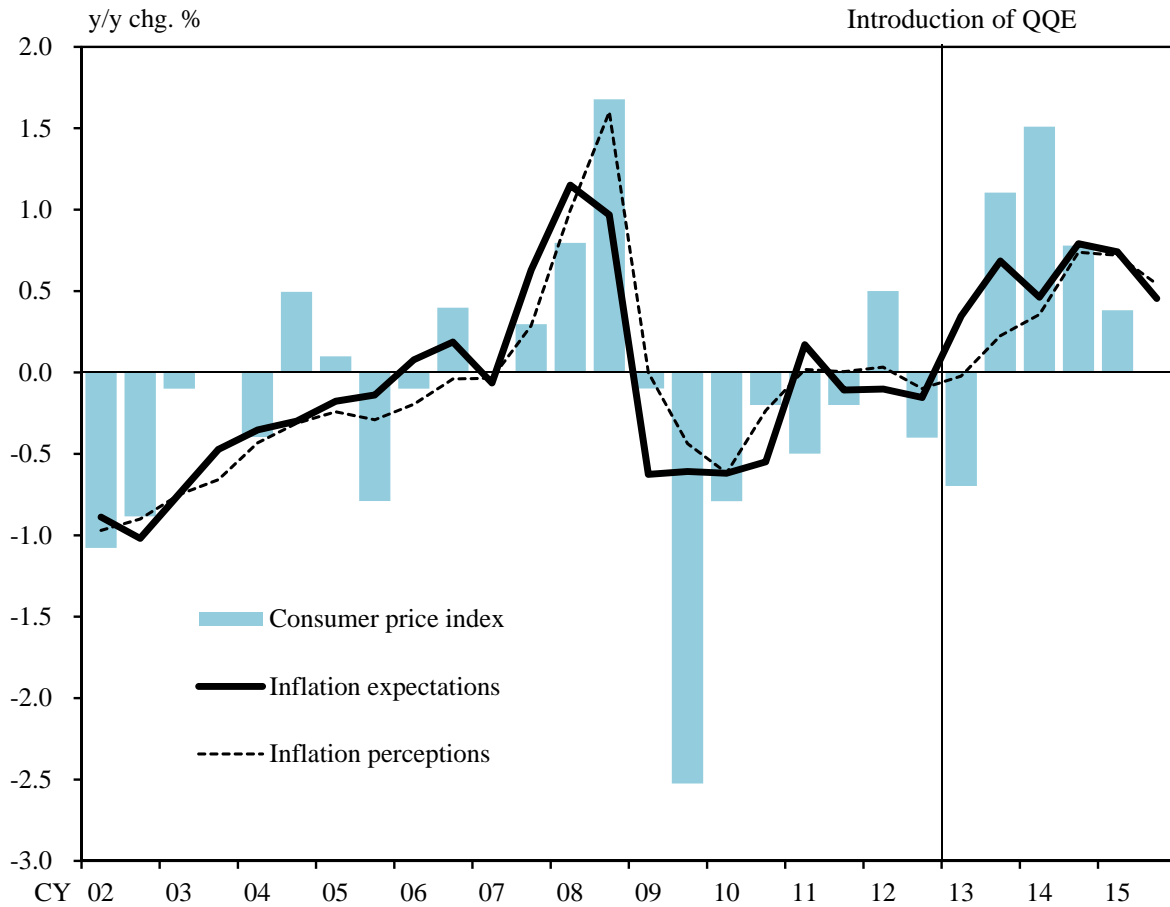
Notes: 1. The parameters are estimated using the modified Carlson-Parkin method. Mean, standard deviation, threshold, dispersion, and biases are year-on-year rate of changes. Threshold  $\delta$  and  $\varepsilon$  are averages of the data.

2. The sample period is from April 2002 to October 2015 for prices, from April 2001 to October 2015 for wages, from April 2001 to April 2015 for economic conditions and consumption, and from October 2005 to April 2015 for business performance, respectively.

### (2) Indicators used in quantification process

Questionnaire	Indicator	Questionnaire	Indicator
Price compared with one year ago	CPI (excluding the effects of the consumption tax hikes) < year-on-year changes >	Economic conditions compared with one year ago	Nominal GDP < year-on-year changes >
Price one year from now		Economic conditions one year from now	
Wage compared with one year ago	Total amount of per capita cash salary < year-on-year changes; three-month moving averages >	Business performance compared with one year ago	Current profit < year-on-year changes >
Wage one year from now		Business performance one year from now	
Spending compared with one year ago	Final expenditure of households < year-on-year changes; four-quarter moving averages >		

## Workers' Perceptions and Expectations regarding Inflation

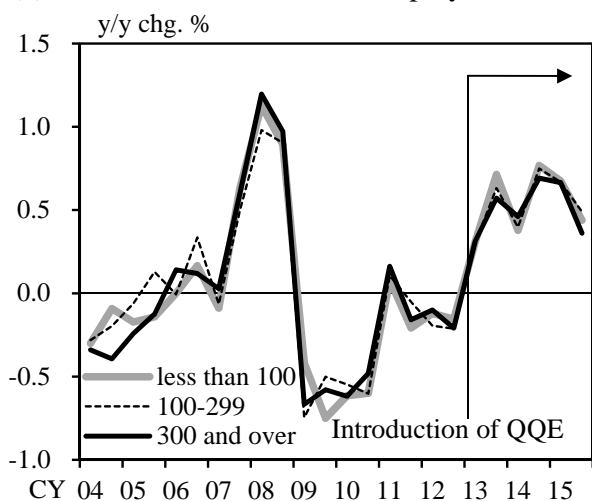


Note: Workers' perceptions and expectations regarding inflation are estimated using a modified Carlson-Parkin method based on consumer price index. Figures exclude the effects of the consumption tax hikes.

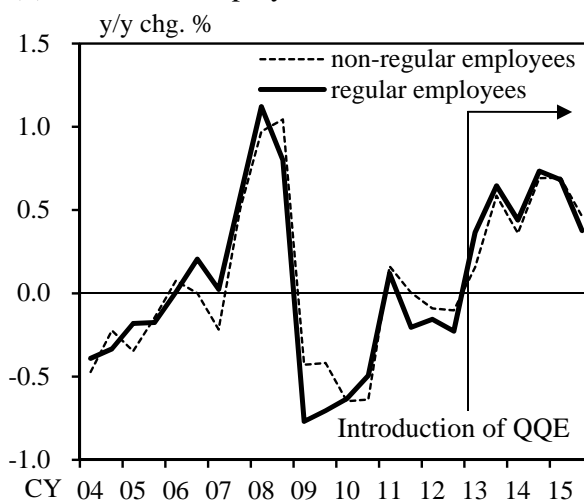
Sources: Ministry of Internal Affairs and Communications, "Consumer Price Index";  
RENGO-RIALS, "The Questionnaire Survey on Work and Life of Workers."

## Inflation Expectations by Workers' Attributes

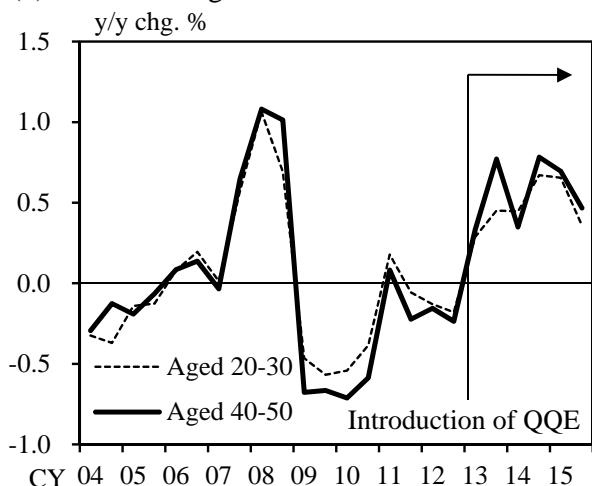
(1) In terms of the number of employees



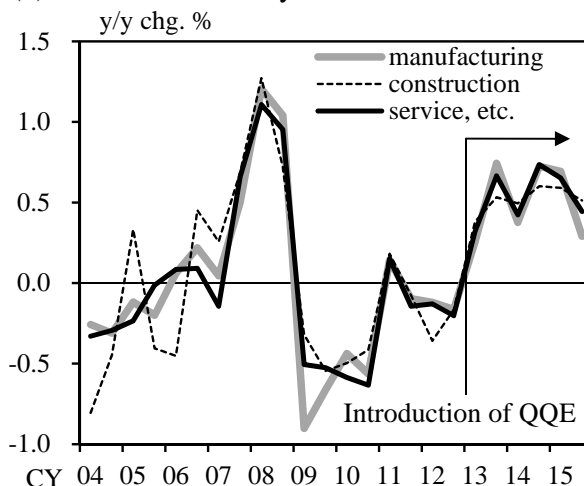
(2) In terms of employment formats



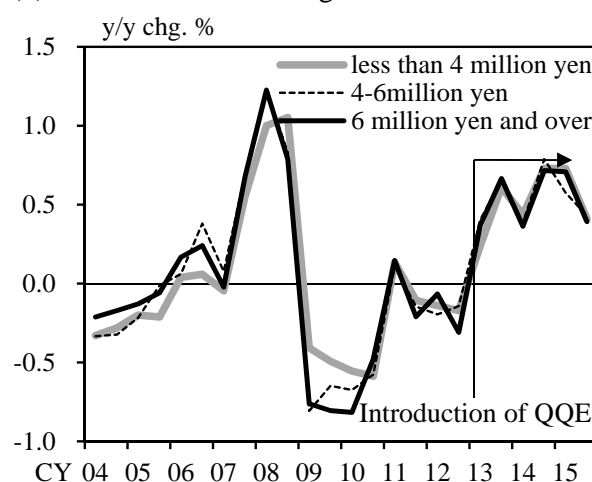
(3) In terms of age



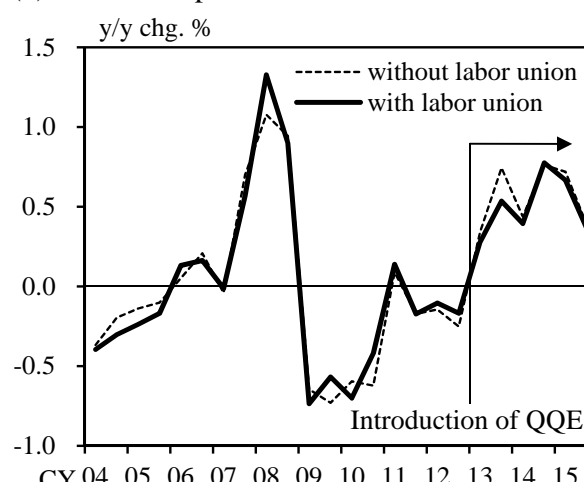
(4) In terms of industry



(5) In terms of annual wage



(6) In terms of presence of labor union



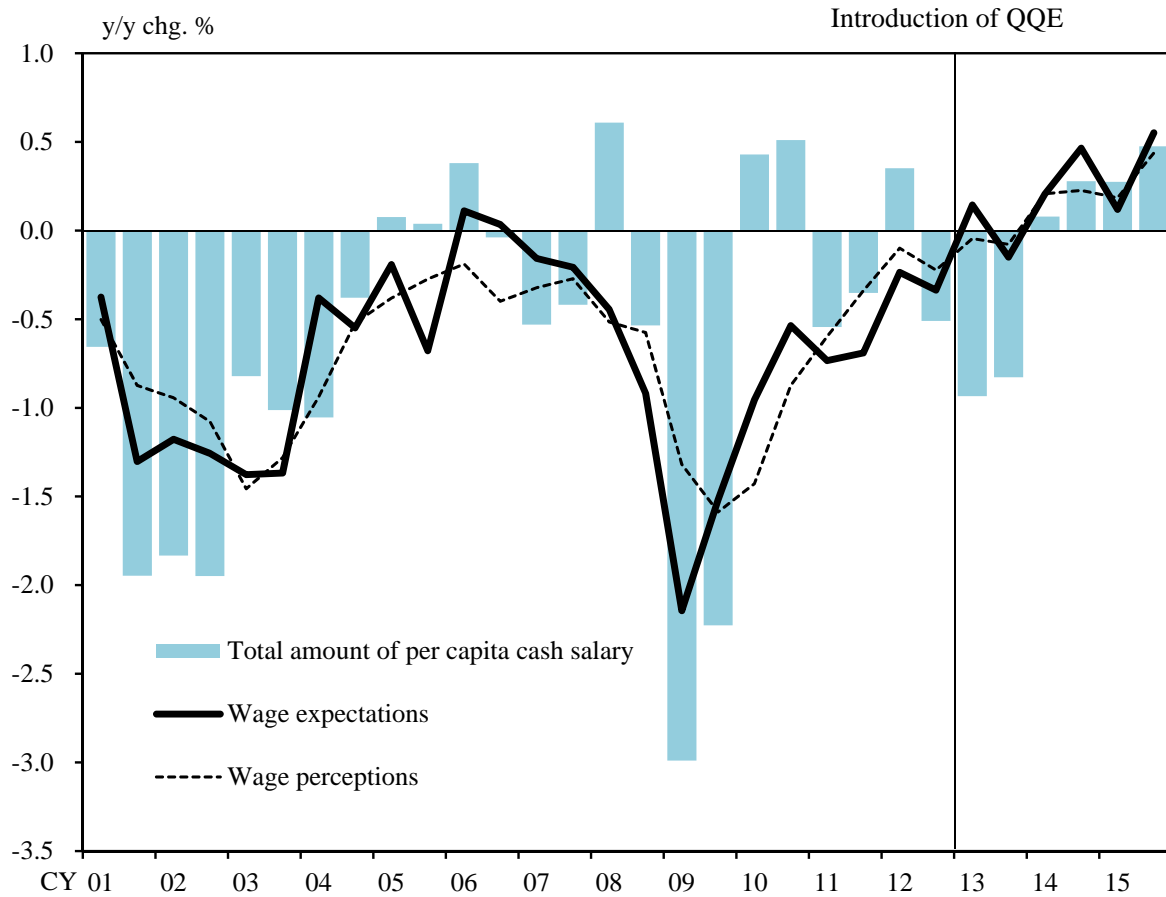
Note: The figures are estimated using the estimated parameters (in Figure 5) based on the assumption that these estimated averages are equal to actual averages.

Sources: Ministry of Internal Affairs and Communications, "Consumer Price Index"; RENGU-RIALS, "The Questionnaire Survey on Work and Life of Workers."



(Figure 8)

## Workers' Perceptions and Expectations regarding Wages

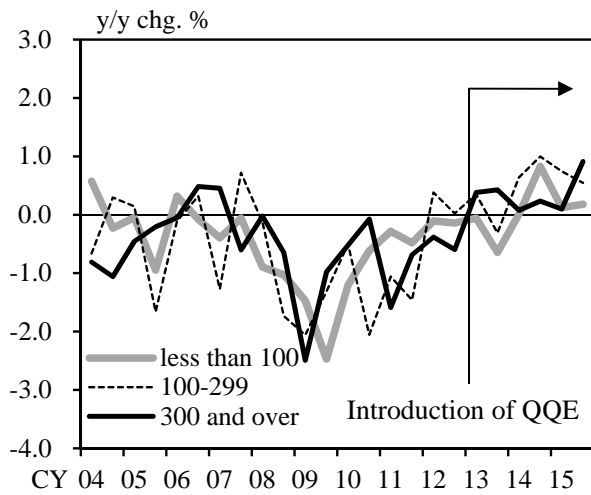


Note: Workers perceptions and expectations regarding wages are estimated using a modified Carlson-Parkin method based on total amount of per capita cash salary.

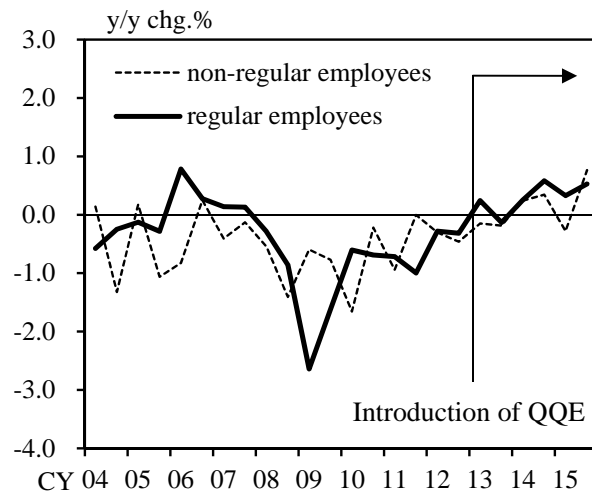
Sources: Ministry of Health, Labour and Welfare, "Monthly Labour Survey";  
RENGO-RIALS, "The Questionnaire Survey on Work and Life of Workers."

## Wage Expectations by Workers' Attributes

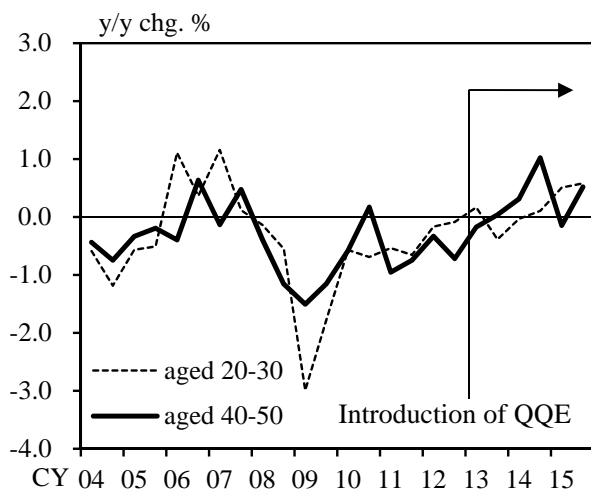
(1) In terms of the number of employees



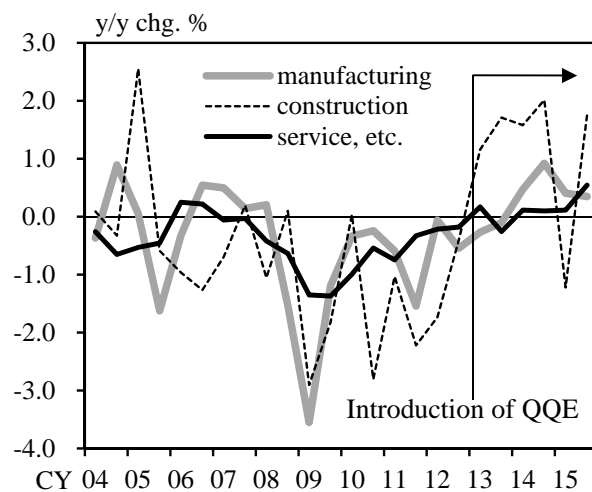
(2) In terms of employment formats



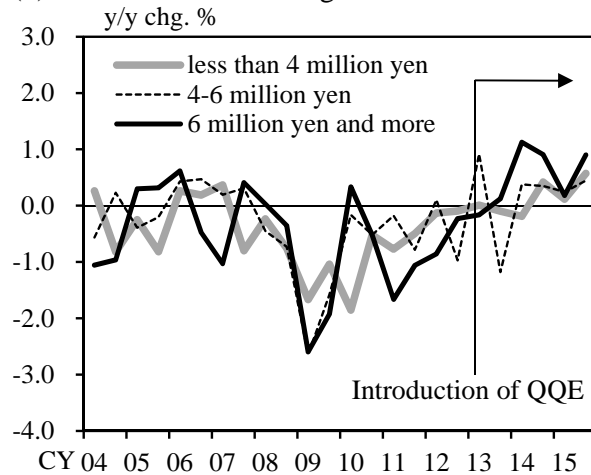
(3) In terms of age



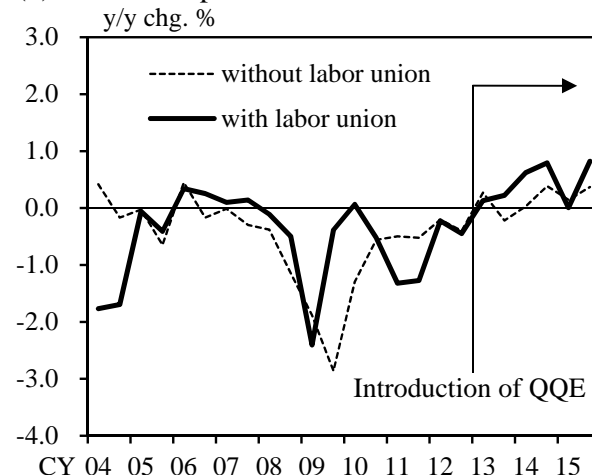
(4) In terms of industry



(5) In terms of annual wage



(6) In terms of presence of labor union

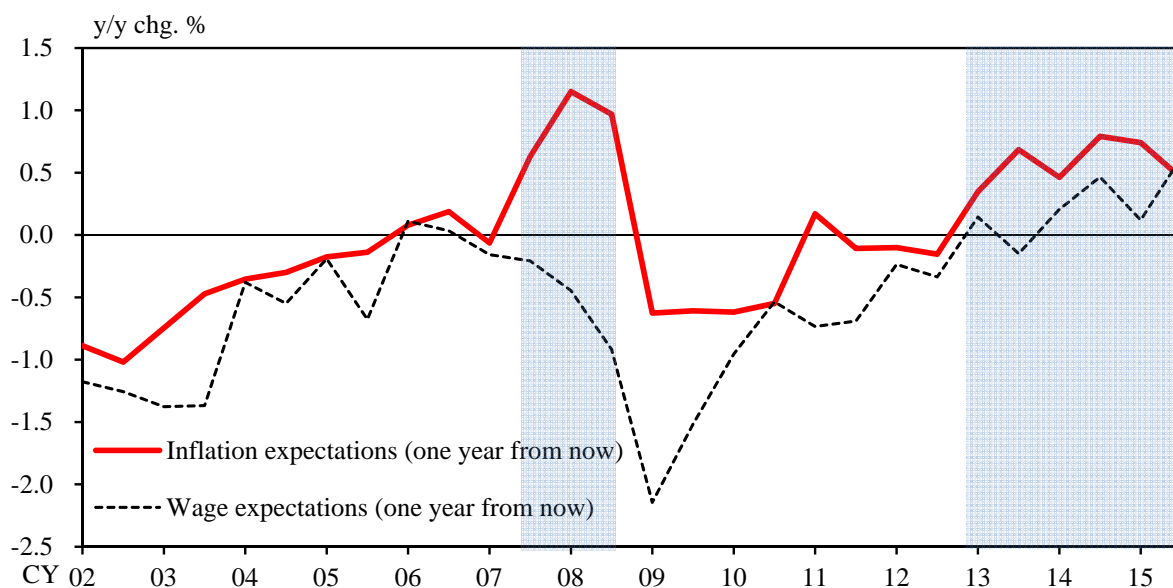


Note: The figures are estimated using the estimated parameters (in Figure 5) based on the assumption that these estimated averages are equal to actual averages.

Sources: Ministry of Health, Labour and Welfare, "Monthly Labour Survey";  
RENGO-RIALS, "The Questionnaire Survey on Work and Life of Workers."

## Relation between Inflation and Wage Expectations

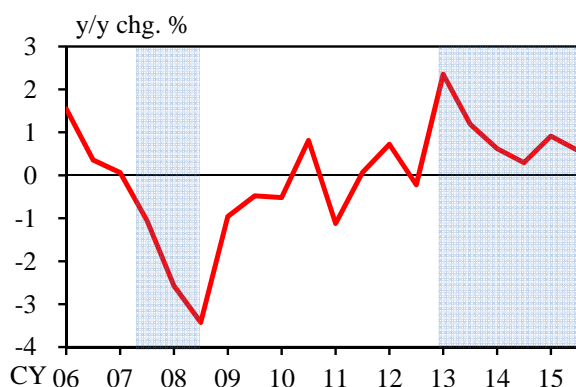
### (1) Inflation and wage expectations



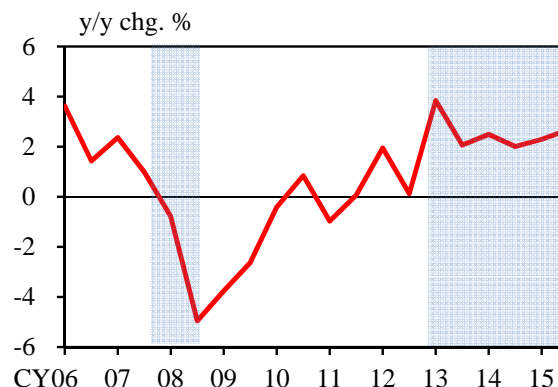
Note: Shaded areas indicate a period where inflation expectations increase by more than 0.3% points.

### (2) Other indicators

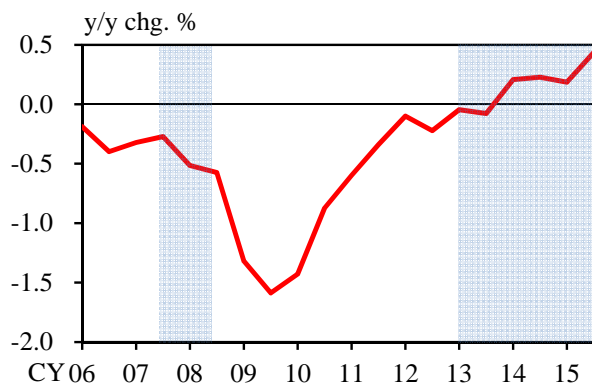
#### a. Economic conditions one year from now



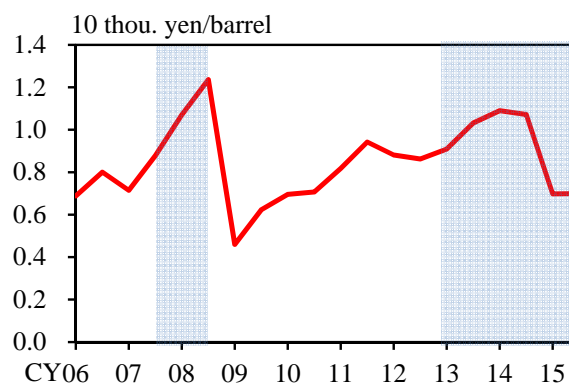
#### b. Business performance one year from now



#### c. Wage perceptions



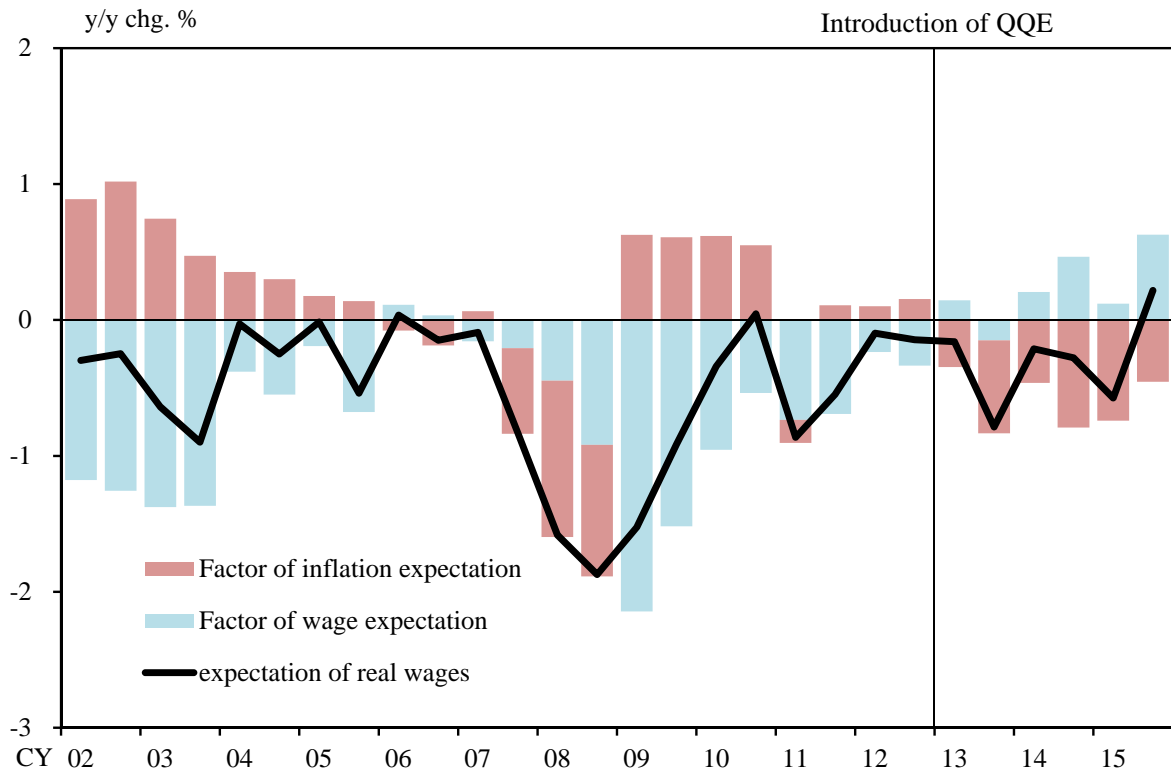
#### d. Oil price (price of north sea brent oil)



Note: Figures are estimated using a modified Carlson-Parkin method based on the estimated parameters (in Figure 5). Sources: Bloomberg; RENGO-RIALS, "The Questionnaire Survey on Work and Life of Workers."

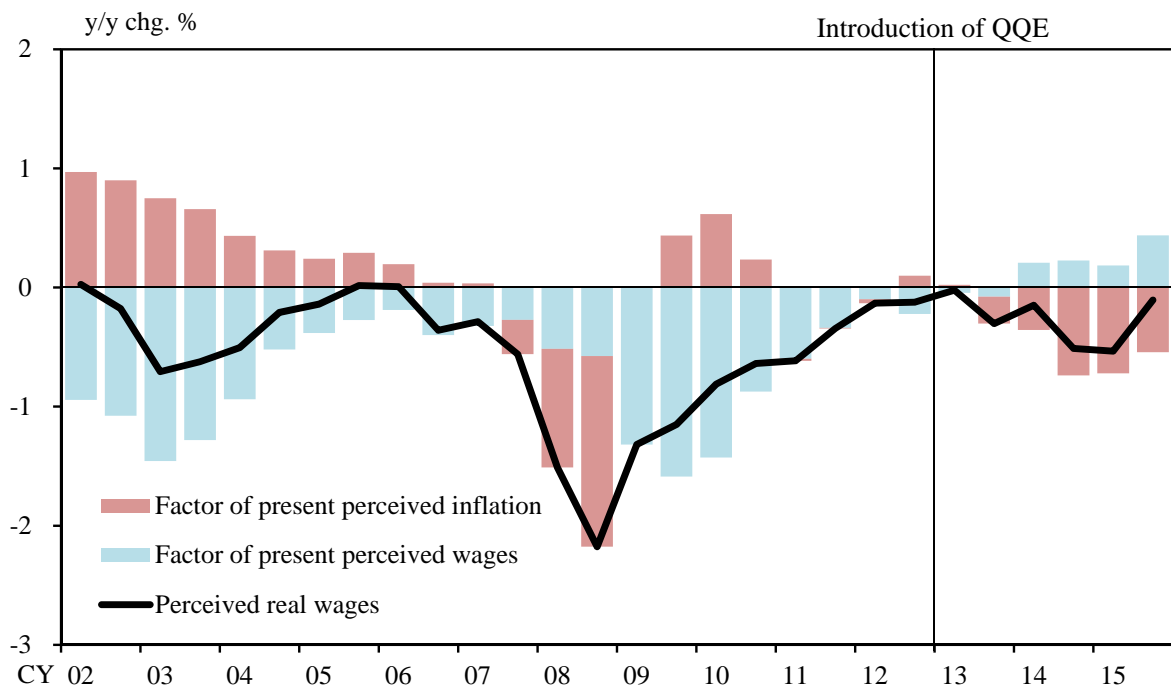
## Workers Perceptions and Expectations regarding Real Wages

### (1) Expectation of real wages



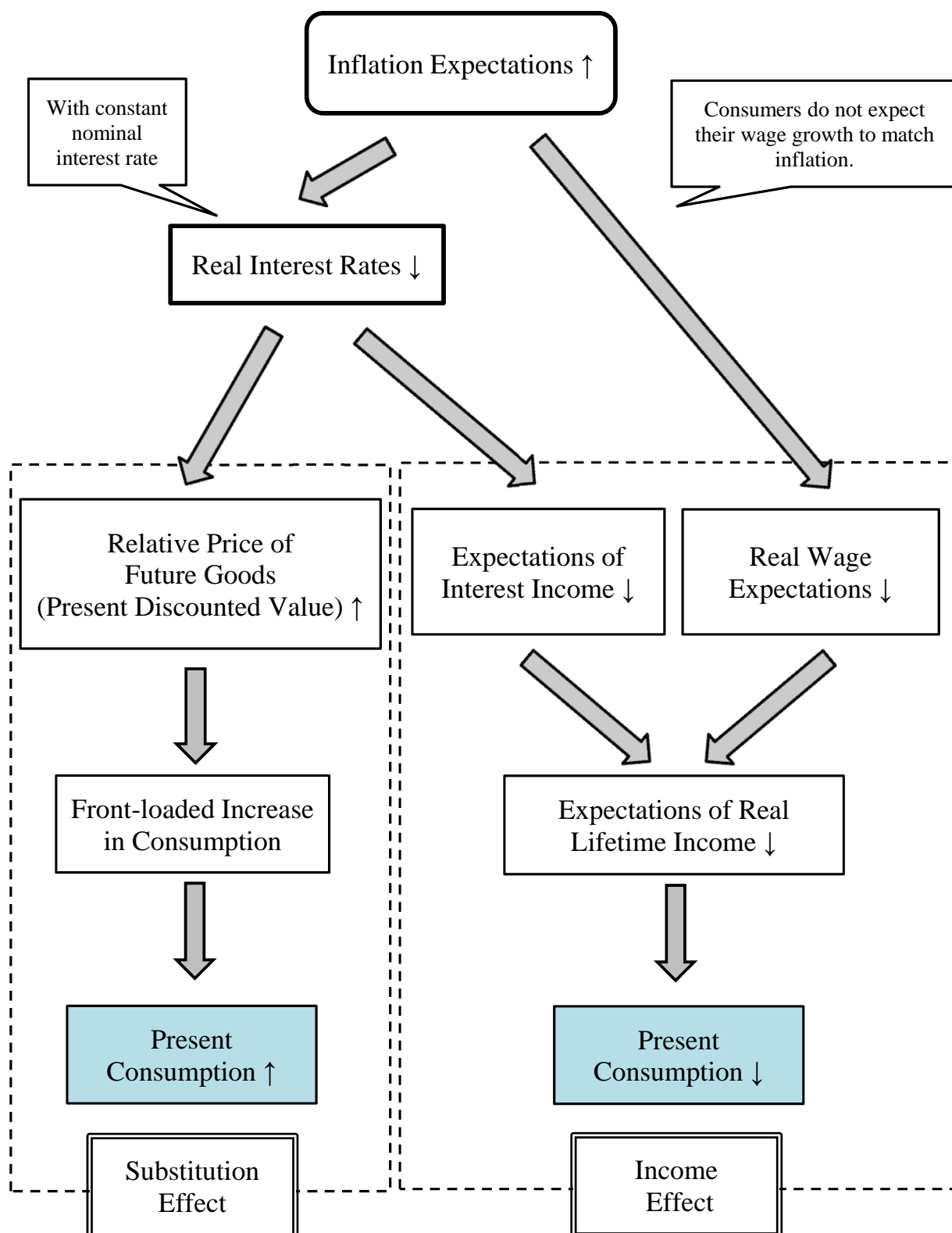
Note: Real wage expectations = wage expectation - inflation expectation. Figures are estimated using the modified Carlson-Parkin method.

### (2) Perceived real wages



Note: Perceived real wages = present perceived wages - present perceived inflation. Figures are estimated using the modified Carlson-Parkin method.

### Transmission Mechanism of Inflation Expectation to Expenditure



Note: We assume that a lender of funds tends to increase demand with an increase of income, and we abstract the influence of pension and asset income.

## Effects of Inflation and Wage Expectations on Consumer Spending (1)

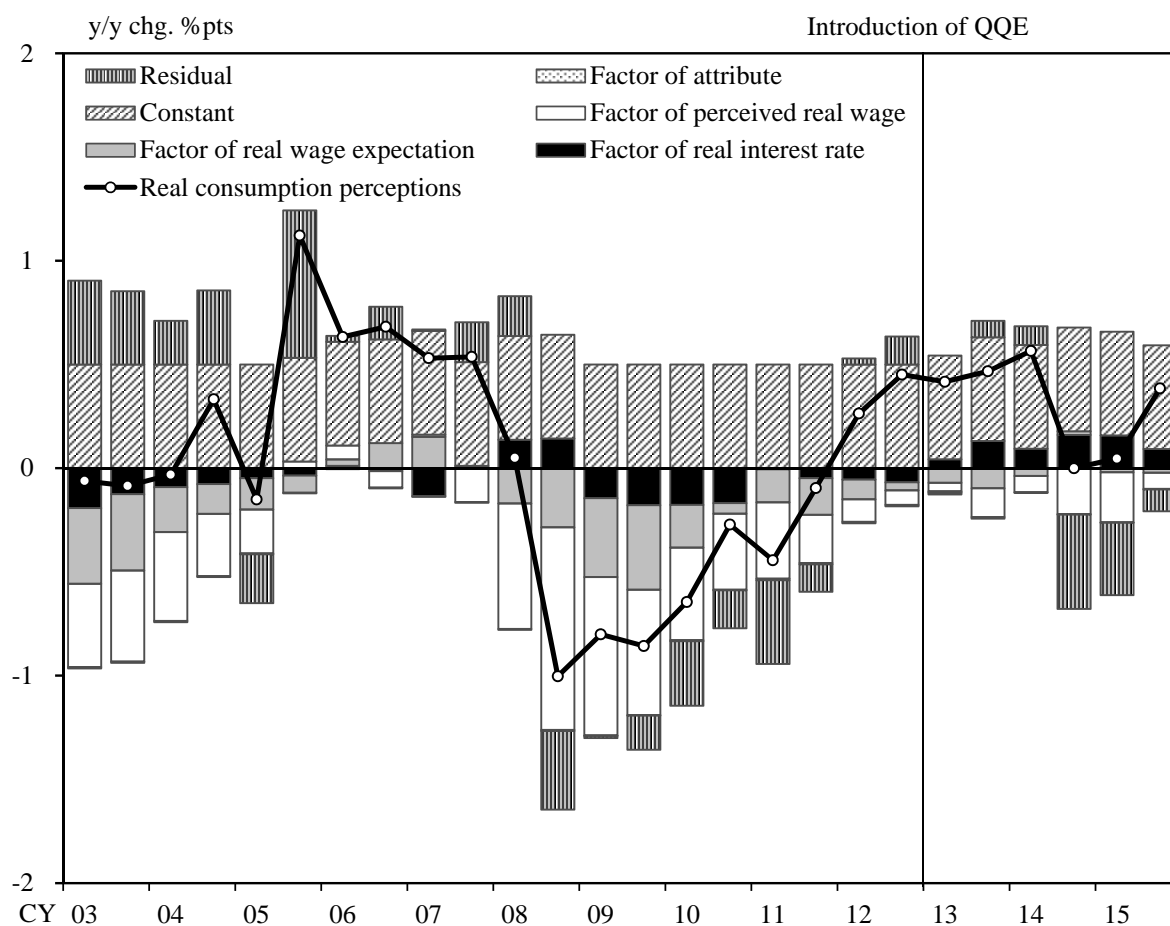
### (1) Effects on real consumption

Dependent variable: Real consumption perceptions (Consumption perceptions - Inflation perceptions, year-on-year rate of changes)							
Sample period: From April 2002 to October 2015							
Explanatory variables	Spec 1	Spec 2	Spec 3	Spec 4	Spec 5	Spec 6	Spec 7
Real interest rate (Nominal rate - Inflation expectations)	-0.24 *** (0.08)	-0.22 * (0.11)	-0.28 *** (0.08)	-0.27 ** (0.09)	-0.23 *** (0.09)	-0.22 ** (0.08)	-0.23 *** (0.08)
Real wage expectations (Wage expectations - Inflation expectations)	0.15 *** (0.04)	0.15 *** (0.04)	0.14 *** (0.04)	0.27 *** (0.04)	0.25 *** (0.04)		
Real wage perceptions (Wage perceptions - Inflation perceptions)	0.47 *** (0.07)	0.46 *** (0.08)	0.55 *** (0.07)			0.59 *** (0.07)	0.65 *** (0.07)
Real interest rate (one-quarter lag)		-0.03 (0.11)					
Real wage expectations (one-quarter lag)	0.12 *** (0.04)	0.12 *** (0.04)		0.19 *** (0.04)			
Real wage perceptions (one-quarter lag)	0.08 (0.07)	0.09 (0.08)				0.16 ** (0.07)	
Constant	0.50 *** (0.05)	0.50 *** (0.06)	0.44 *** (0.05)	0.31 *** (0.05)	0.19 *** (0.05)	0.47 *** (0.06)	0.41 *** (0.05)
Fixed effect of age	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.391	0.389	0.326	0.251	0.134	0.334	0.290
Sample size	216	216	224	216	224	216	224

Notes: 1. Standard errors in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.  
 2. Data for nominal rates are call rate (overnight, uncollateralized); for inflation expectation, they are the prices one year from now; for present perceived inflation, they are the prices compared with one year ago; for wage expectations, they are the wages one year from now; for present perceived wages, they are the wages compared with one year ago; and for present perceived consumption, they are the consumptions compared with one year ago.

## Effects of Inflation and Wage Expectations on Consumer Spending (2)

(2) Contribution to real consumption < spec 1 >



Note: Figures are calculated by accumulating the results of each groups.

Sources: Cabinet Office, "National Accounts"; Ministry of Health, Labour and Welfare, "Monthly Labour Survey"; Ministry of Internal Affairs and Communications, "Consumer Price Index"; RENGO-RIALS, "The Questionnaire Survey on Work and Life of Workers."

## Expectation Formation of wages (one year from now)

Dependent variable: Wage expectations for one year from now

(will increase significantly, will increase slightly, will remain almost unchanged,  
will decrease slightly, will decrease significantly)

Explanatory variables	Spec 1	Spec 2	Spec 3
Inflation perceptions (Prices compared with one year ago)	0.06 ** (0.03)	0.04 (0.03)	0.01 (0.01)
Wage perceptions (Wages compared with one year ago)	0.58 *** (0.02)	0.60 *** (0.02)	0.59 *** (0.01)
Perception of economic conditions (Economic conditions compared with one year ago)	0.10 *** (0.03)	0.11 *** (0.03)	0.07 *** (0.01)
Short-term outlook for economic conditions (Economic conditions one year from now)	0.14 *** (0.03)	0.19 *** (0.03)	0.16 *** (0.01)
Long-term outlook for economic conditions (Economic conditions three years from now)	0.02 (0.03)		
Perception of business performance (Business performance compared with one year ago)	-0.04 (0.03)	-0.01 (0.03)	0.08 *** (0.01)
Short-term outlook for business performance (Business performance one year from now)	0.24 *** (0.03)	0.39 *** (0.03)	0.34 *** (0.01)
Long-term outlook for business performance (Business performance three years from now)	0.31 *** (0.03)		
Fixed effect of age	Yes	Yes	Yes
Fixed effect of employment formats	Yes	Yes	Yes
Fixed effect of the number of employees	Yes	Yes	Yes
Fixed effect of survey date	Yes	Yes	Yes
Threshold $\beta_1$	1.03	0.79	0.61
Threshold $\beta_2$	2.96	2.68	2.45
Threshold $\beta_3$	5.05	4.73	4.47
Threshold $\beta_4$	6.08	5.74	5.58
Pseudo R <sup>2</sup>	0.22	0.21	0.20
Estimation periods	From Apr. 2013 to Apr. 2015	From Apr. 2013 to Apr. 2015	From Oct. 2005 to Oct. 2015
Sample size	4,287	4,287	25,017

- Notes: 1. Standard errors in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.
2. In the estimation, we convert the qualitative data into the quantity data as follows: “Will rise significantly” = 1, “will rise slightly” = 2, “will remain almost unchanged” = 3, “will drop slightly” = 4, and “will drop significantly” = 5.
3. The fixed effect of age is estimated using dummy variables of age group (50s, 40s, 30s, and 20s); that of employment formats is estimated using dummy variables of regular employees, part-time, so called “arbeit” workers, contract, and temps; that of the number of employees is estimated using dummy variables of less than 29, 30-99, 100-299, 300-999, and 1,000 and more employees; and that of survey date is estimated using time dummy variables.



Expectation Formation of Wages (three and five years from now)

Explanatory variables	Dependent variable: wage expectations (three years from now)	Dependent variable: wage expectations (five years from now)
Inflation perceptions	0.02 (0.03)	0.07 *** (0.02)
Wage perceptions	0.40 *** (0.02)	0.33 *** (0.02)
Perception of economic conditions	0.11 *** (0.03)	0.05 * (0.03)
Short-term outlook for economic conditions	0.07 ** (0.03)	0.09 *** (0.03)
Long-term outlook for economic conditions	0.21 *** (0.03)	0.13 *** (0.03)
Perception of business performance	-0.05 ** (0.03)	-0.05 ** (0.03)
Short-term outlook for business performance	0.10 *** (0.03)	0.13 *** (0.03)
Long-term outlook for business performance	0.45 *** (0.03)	0.32 *** (0.03)
Fixed effect of age	Yes	Yes
Fixed effect of employment formats	Yes	Yes
Fixed effect of the number of employees	Yes	Yes
Fixed effect of survey date	Yes	Yes
Threshold $\beta_1$	0.83	-0.11
Threshold $\beta_2$	2.76	1.69
Threshold $\beta_3$	4.62	3.15
Threshold $\beta_4$	5.74	3.85
Pseudo R <sup>2</sup>	0.22	0.17
Estimation period	From Apr. 2013 to Apr. 2015	From Apr. 2013 to Apr. 2015
Sample size	4,287	4,287

- Notes: 1. Standard errors in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.
2. In the estimation, we convert the qualitative data into the quantity data as follows: “Will rise significantly” = 1, “will rise slightly” = 2, “will remain almost unchanged” = 3, “will drop slightly” = 4, and “will drop significantly” = 5.
3. The fixed effect of age is estimated using dummy variables of age group (50s, 40s, 30s, and 20s); that of employment formats is estimated using dummy variables of regular employees, part-time, so called “arbeit” workers, contract, and temps; that of the number of employees is estimated using dummy variables of less than 29, 30-99, 100-299, 300-999, and 1,000 and more employees; and that of survey date is estimated using time dummy variables.

## Expectation Formation of Wages (in terms of employment formats)

Dependent variable: wage expectations (one year from now, 100 and more employees)

Explanatory variables	Spec 1	Spec 2	Spec 3
Inflation perceptions	0.06 (0.07)	0.06 (0.07)	-0.01 (0.02)
Wage perceptions	0.45 *** (0.06)	0.46 *** (0.06)	0.47 *** (0.02)
Perception of economic conditions	0.12 (0.08)	0.12 (0.08)	0.08 *** (0.02)
Short-term outlook for economic conditions	0.11 (0.08)	0.15 ** (0.07)	0.14 *** (0.02)
Long-term outlook for economic conditions	-0.01 (0.08)		
Perception of business performance	-0.05 (0.08)	0.00 (0.08)	0.08 *** (0.03)
Short-term outlook for business performance	0.31 *** (0.10)	0.41 *** (0.09)	0.28 *** (0.03)
Long-term outlook for business performance	0.27 *** (0.09)		
(*) Inflation perceptions	-0.02 (0.08)	-0.04 (0.08)	0.02 (0.03)
(*) Wage perceptions	0.13 * (0.07)	0.14 ** (0.07)	0.16 *** (0.02)
(*) Perception of economic conditions	-0.02 (0.09)	-0.01 (0.09)	-0.03 (0.03)
(*) Short-term outlook for economic conditions	0.05 (0.10)	0.07 (0.08)	0.01 (0.03)
(*) Long-term outlook for economic conditions	0.05 (0.09)		
(*) Perception of business performance	-0.02 (0.09)	-0.03 (0.09)	-0.01 (0.03)
(*) Short-term outlook for business performance	-0.10 (0.11)	-0.02 (0.10)	0.04 (0.03)
(*) Long-term outlook for business performance	0.06 (0.10)		
Fixed effect of age	Yes	Yes	Yes
Fixed effect of employment formats	Yes	Yes	Yes
Fixed effect of the number of employees	Yes	Yes	Yes
Fixed effect of survey date	Yes	Yes	Yes
Threshold $\beta_1$	0.68	0.52	0.00
Threshold $\beta_2$	2.57	2.36	1.95
Threshold $\beta_3$	4.59	4.34	3.88
Threshold $\beta_4$	5.68	5.41	4.99
Pseudo R <sup>2</sup>	0.22	0.21	0.19
Estimation period	From Apr. 2013 to Apr. 2015	From Apr. 2013 to Apr. 2015	From Oct. 2005 to Oct. 2015
Sample size	2,368	2,368	14,989

- Notes: 1. Standard errors in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.
2. In the estimation, we convert the qualitative data into the quantity data as follows: “Will rise significantly” = 1, “will rise slightly” = 2, “will remain almost unchanged” = 3, “will drop slightly” = 4, and “will drop significantly” = 5.
3. The fixed effect of age is estimated using dummy variables of age group (50s, 40s, 30s, and 20s); that of employment formats is estimated using dummy variables of regular employees, part-time, so called “arbeit” workers, contract, and temps; that of the number of employees is estimated using dummy variables of 100-299, 300-999, and 1,000 and more employees; and that of survey date is estimated using time dummy variables.
4. (\*) indicates the interaction term of regular employees.

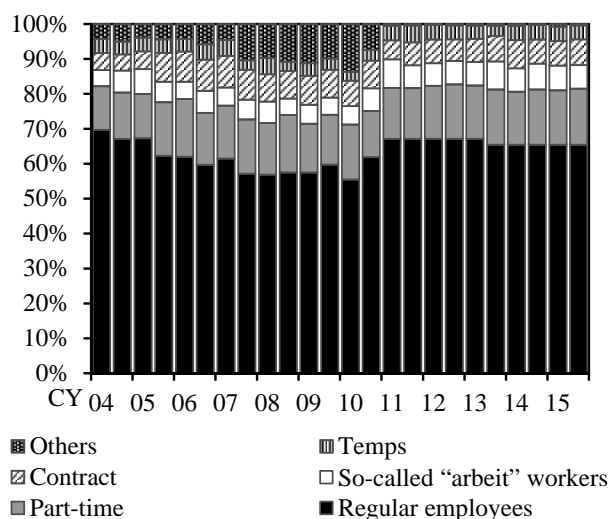
## Expectation Formation of Wages (in terms of presence of labor unions)

Dependent variable: wage expectation (one year from now, regular employees, 100 and more employees)			
Explanatory variables	Spec 1	Spec 2	Spec 3
Inflation perceptions	0.07 (0.05)	0.04 (0.05)	0.02 (0.02)
Wage perceptions	0.57 *** (0.05)	0.59 *** (0.05)	0.63 *** (0.02)
Perception of economic conditions	0.19 *** (0.06)	0.20 *** (0.06)	0.05 ** (0.02)
Short-term outlook for economic conditions	0.13 ** (0.06)	0.21 *** (0.05)	0.14 *** (0.02)
Long-term outlook for economic conditions	0.06 (0.06)		
Perception of business performance	-0.19 *** (0.06)	-0.15 *** (0.06)	0.04 (0.02)
Short-term outlook for business performance	0.28 *** (0.06)	0.42 *** (0.06)	0.35 *** (0.03)
Long-term outlook for business performance	0.29 *** (0.06)		
(*)	Inflation perceptions	-0.04 (0.06)	-0.04 (0.06)
	Wage perceptions	0.00 (0.07)	-0.01 (0.07)
	Perception of economic conditions	-0.13 (0.09)	-0.13 (0.09)
	Short-term outlook for economic conditions	0.03 (0.10)	0.00 (0.08)
	Long-term outlook for economic conditions	-0.08 (0.09)	
	Perception of business performance	0.25 *** (0.08)	0.24 *** (0.08)
	Short-term outlook for business performance	-0.13 (0.10)	-0.07 (0.09)
	Long-term outlook for business performance	0.09 (0.10)	
Fixed effect of age	Yes	Yes	Yes
Fixed effect of the number of employees	Yes	Yes	Yes
Fixed effect of survey date	Yes	Yes	Yes
Threshold $\beta_1$	0.94	0.75	0.29
Threshold $\beta_2$	2.92	2.69	2.39
Threshold $\beta_3$	4.89	4.62	4.24
Threshold $\beta_4$	5.97	5.66	5.41
Pseudo R <sup>2</sup>	0.23	0.21	0.21
Estimation period	From Apr. 2013 to Apr. 2015	From Apr. 2013 to Apr. 2015	From Oct. 2005 to Oct. 2015
Sample size	1,738	1,738	10,716

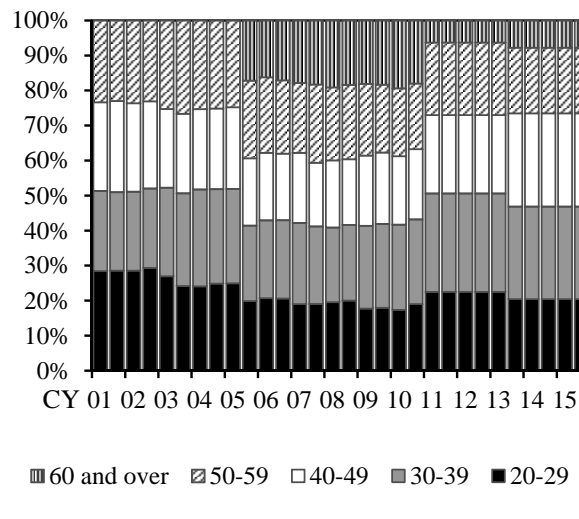
- Notes: 1. Standard errors in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.  
 2. In the estimation, we convert the qualitative data into the quantity data as follows: “Will rise significantly” = 1, “will rise slightly” = 2, “will remain almost unchanged” = 3, “will drop slightly” = 4, and “will drop significantly” = 5.  
 3. The fixed effect of age is estimated using dummy variables of age group (50s, 40s, 30s, and 20s); that of the number of employees is estimated using dummy variables of 100-299, 300-999, and 1,000 and more employees; and that of survey date is estimated using time dummy variables.  
 4. (\*) indicates the interaction term of a regular employees whose workplace has a labor union.

## Respondents' Attributes

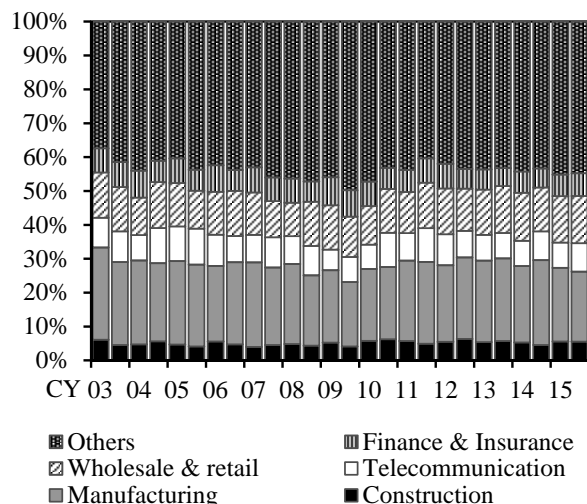
(1) Employment formats



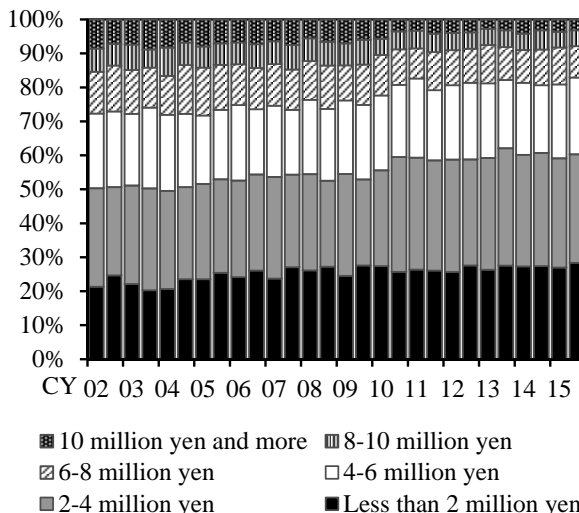
(2) Age



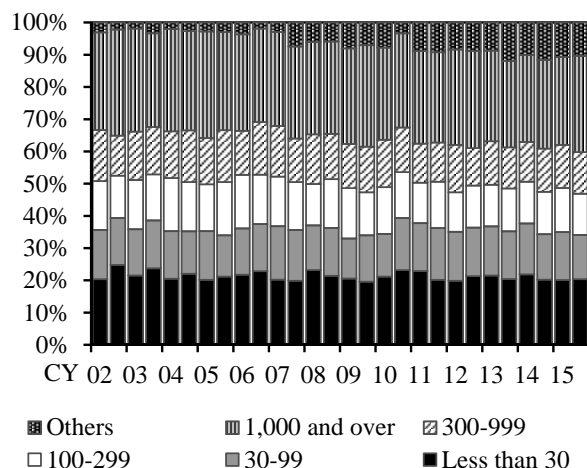
(3) Industry



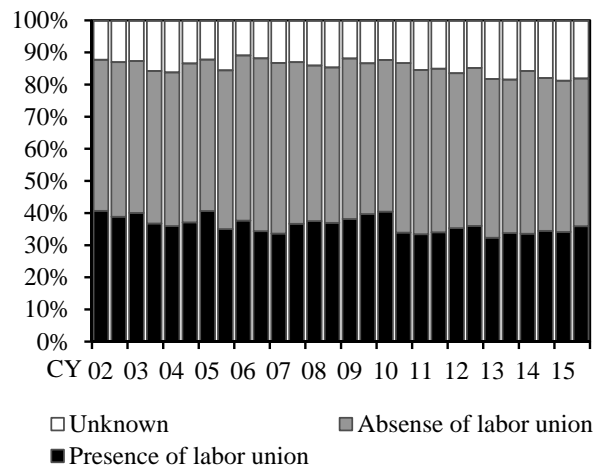
(4) Annual wage



(5) A number of employees



(6) Labor union



Source: RENGO-RIALS, "The Questionnaire Survey on Work and Life of Workers."