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\* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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# Individual inflation expectations in a declining-inflation environment: Evidence from survey data<sup>\*</sup>

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## Abstract

The paper analyses individual inflation expectations in the Netherlands over the period 2008-2014. The empirical evidence is based on the DNB Household Survey, a longitudinal online panel survey representative of Dutch-speaking population. The focus is on inflation measures based on information about the general price level, the aggregate real estate price and the price of the own house. Both individual background microeconomic characteristics and macroeconomic variables are taken into account in our empirical models devoted to explain the main determinants of inflation expectations. We find that inflation expectations decrease over the years, suggesting that individuals can pick up the direction of the price change, but respondents do not report high risk of deflation. The target inflation of 2 percent seems to be well anchored in individual expectations.

**Keywords:** Inflation Risk, Survey Data, Subjective expectations.

**JEL classifications:** C23, C5, C8, D12, D84.

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## 1. Introduction

Inflation expectations influence people's decisions about saving, investment and consumption (Englander and Stone, 1989). Inflation expectations reflect individuals' perceptions of real interest rates, a key determinant of consumers' decisions in the housing market. In addition, inflation expectations play a central role in the functioning of labour markets, via wage negotiations, which in turn can matter for price setting. In economies where labour market developments have a substantial impact on inflation dynamics, inflation expectations are important for policymakers. As a matter of fact, central banks increasingly rely on several measures of inflation expectations (either from professional investors, or from consumers, or from non-financial business surveys) in taking monetary policy decisions. Low interest rates and weak economic growth have recently boosted the discussion about the effect of inflation expectations on realized inflation and about how expectations are formed. Many studies based on DSGE models (e.g. Christiano et al. (2005)) have shown that a negative monetary shock (defined as an expansionary shock that lowers interest rates) can stimulate aggregate spending. However, these studies do not take into account the fact that the economy is already experiencing low interest rates at the time of the shock (the so-called "zero lower bound"). Major industrialized countries did not face this problem until recently (except Japan). One way to get around the resulting liquidity trap that neutralizes the effects of an expansionary monetary policy on credit supply and on economic growth is to raise inflation expectations.

Inflation expectations have been measured in several ways in the literature, depending on the subjects involved (professional investors versus consumers), on the information source (market-based versus survey-based), or on the time horizon (short-run vs long-run). One of the oldest survey about inflation expectations is the Reuters/Michigan Survey of Consumers. This survey has been administered since 1953, initially three times per year, then quarterly from 1960 through 1977, and monthly since 1978. The ECB Survey of Professional Forecasters is a quarterly survey of expectations for the rates of inflation, real GDP growth and unemployment in the euro area for several horizons, together with a quantitative assessment of the uncertainty surrounding them. The participants to the Survey of Professional Forecasters are experts affiliated with financial or non-financial institutions based within the European Union (Garcia, 2003). van den End and Pattipeilohy (2015) focus on market-based short-run inflation expectations defined as 1yr/1yr forward inflation indexed swaps, and on market-based long-run inflation expectations defined as 5yr/5yr forward inflation indexed swaps. Berk (2002), and Strobach and van der Cruijsen (2015) focus on the monthly European Commission's consumer survey, instead. A more comprehensive review of inflation expectations measures can be found in Galati et al. (2011).

In this paper we examine whether Dutch households can actually predict periods of low (or even negative) inflation when updating their inflation expectations. In particular, this paper addresses two main research questions. We first study whether there is any evidence that individuals expected low or negative inflation

in recent years. We then analyze the determinants of low/negative inflation expectations, by considering individual (or household) microeconomic characteristics and by controlling for macroeconomic variables.

The methodology implemented in this paper is based on the use of survey panel data for the Netherlands to identify the characteristics of the fraction of individuals who expect inflation to be below the ECB target of 2 percent. Inflation expectations through survey, though not perfect, are shown to be informative: consumers update their inflation expectations in response to new information and that information dissemination may lead to more informed and reliable reporting of inflation expectations (Armantier et al., 2013). In addition, there is strong evidence that inflation expectations are anchored at the target of central banks (see Easaw et al. (2012) for an overview of the literature). Easaw et al. (2012) also find that expectations are driven by actual inflation, and are usually above the target set by the ECB. In our study, the data is taken from the DNB Household Survey for the years running between 2008 and 2014. The analysis is driven by data availability and therefore it is focused on expectations about changes of price in general in the next twelve months and expectations about changes of aggregate real estate prices in the next two years. For each of these measures we show how they evolve over time and how they compare with the change of the Consumer Price Index (CPI) and the House Price Index respectively, both provided by Statistics Netherlands. We then estimate empirical microeconomic models in which macroeconomic developments and a year trend are included to take common factors affecting individual expectations into account.

The time span analyzed in this paper, characterized by inflation swings and unusually low inflation rates, is challenging for consumers to form expectations. Figure 1 depicts the year-average inflation rate for the Netherlands and the Eurozone.<sup>2</sup> The figure highlights that the two inflation rates have a rather comparable pattern during the period analyzed in this study. The lowest levels of the inflation rates were in 2009 and 2014 for the Eurozone and 2009, 2010 and 2014 for the Netherlands. Figure 2 shows the percentage changes of the inflation rate and those of the house price index for the Netherlands. While the former has never been negative, the latter has taken negative values in 2009, 2012 and 2013. In fact, the percentage swings are much more prominent for the house price index that fell by -3.5% in 2009. The unsynchronized patterns of the inflation rate and of the house price index motivate the choice to focus on individual expectations relative to both variables in our analysis.

*Figures 1 and 2 about here*

This study makes an additional contribution to the literature about the determinants of inflation expectations, by studying expectations in a period characterized by unstable inflation rates, unconventional

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<sup>2</sup>To be able to compare both inflation rates, we use the harmonized consumer price index (HCPI). However, in the rest of our analysis we use the consumer price index (CPI) for the Netherlands, because the HCPI also includes expenditure by foreigners in the Netherlands (CBS, 2016).

monetary policies and unusually low interest rates. In this environment we focus on the role of both individual background characteristics and macroeconomic variables contemporaneously. A lot of attention has been paid on the effects of demographic characteristics on inflation expectations: individuals with lower levels of education, singles, females or belonging to ethnic minorities tend to report higher inflation (see Bryan and Venkatu (2001), Pfajfar and Santoro (2008), Bruine de Bruin et al. (2010), Easaw et al. (2012), among others). The role of age is less clear cut as the effect is not robust across studies (see Bruine de Bruin et al. (2010) for a critical discussion). One potential explanation for the role of demographic differences on individual inflation expectations is that different subgroups of consumers are confronted with different prices for their daily purchases (Bryan and Venkatu (2001)). However, this hypothesis has not been confirmed in the literature: the difference in price expectation is not explained by differences in the price of the product baskets of different demographic groups (Hobijn et al. (2009), Bruine de Bruin et al. (2010)). Some other studies suggest that demographic differences are correlated with the level of financial literacy (Cruijssen et al. (2010), Burke and Manz (2014)). Low financial literacy may indicate that individuals are not able to correctly form price expectations. Cruijssen et al. (2010) show that better knowledge about the objectives of the ECBs monetary policy is positively correlated with better inflation predictions. Burke and Manz (2014) also find a positive relationship between financial literacy and unbiased price expectations: the respondents that use higher quality information and that use the information efficiently are also the ones predicting inflation more closely to realized inflation.

The role of macroeconomic variables on inflation expectations is also well documented in the literature (see Clark and Davig (2008) and Galati et al. (2011) for a review). To mention a few, Berk (2002) shows that inflation expectations do not react in a systematic way to changes in inflation and unanticipated changes in short-term interest rates. Mankiw et al. (2004) analyze whether inflation expectations are influenced by actual inflation, unemployment and output. Their findings suggest a weak effect of these variables on expectations about price changes. In our study, we include a few macroeconomic variables to control for possible systemic effects on the inflation expectations.

Housing wealth is an important component of household total wealth and buying a house represents one of the most relevant life-cycle decisions a household faces. Our study provides an additional contribution also to the empirical literature on house price expectations. Little research has been done so far since data on expectations of house prices' changes is limited. Case et al. (2014) have performed a survey in four metropolitan areas in the U.S. in different periods and they find a strong correlation between house price expectations and actual house prices. Niu and Van Soest (2014) also use data from the U.S. and find that house price expectations are higher in areas where house prices have been low. Furthermore, the authors look at the influence of economic variables and personal characteristics. They find a significantly negative effect for unemployment rate at the macro level, for gender and age; on the other hand the effect is significantly positive for income and education.

The relationship between consumption and inflation expectations has also been studied by, for example, Berben and Stokman (2015) with Dutch data, and Ichiue and Nishiguchi (2015) with Japanese data. In both studies, the authors find a negative relationship between inflation expectation and future consumption, which is in line with economic theory. Unfortunately our data set does not contain data on consumption, therefore we are not able to test this hypothesis in our paper.

The main findings of our paper can be summarized as follows. Inflation expectations adjust slowly to realized inflation and there is modest evidence of deflation in the period considered in our analysis. Individuals better assess the dynamics of market housing prices than that of prices in general. Turning to consumer price inflation, we find a strongly significant year effect. This suggests that in more recent years the respondents have picked up the declining trend of inflation. The main determinants of low (or even negative) inflation expectations are gender and age together with macroeconomic factors such as actual lagged inflation and unemployment. The effects of the macroeconomic variables are often stronger than the effects of demographic characteristics. We find a strongly significant year effect also when we study inflation expectations in terms of deviations from realized inflation. The empirical evidence shows that in more recent years the deviation between expected and realized inflation has reduced. Whether this is due to a learning effect is hard to argue. This paper highlights that individual inflation expectations are still pretty well anchored at the 2-% ECB target level. Whether this is due to the credibility of monetary policy, or to an optimistic view of price dynamics, or simply to persistently wrong expectations remains an open question to both policy makers and academics.

The paper is organized as follows. Section 2 provides a description of the empirical models estimated in the paper. Section 3 describes the data used in the empirical analysis. Particular emphasis is devoted to the measures of inflation expectations, on how they have been elicited and on how they have evolved in recent years. Section 4 reports and discusses the empirical results. Section 5 concludes.

## 2. Empirical models

We implement two sets of models to study inflation expectations. We first analyze inflation expectations in levels, and then we analyze inflation expectations in terms of deviation from the realized inflation. The corresponding empirical results will be described in the next subsection 4.1 and in subsection 4.2, respectively.

We start to model expectations of household  $h$  at calendar year  $t$  for both changes in the general price level and the aggregate real estate price as follows:

$$Y1_{ht} = \alpha X_h + \beta Z_t + \gamma Year_t + \epsilon_{ht} \quad (1)$$

where  $Y1_{ht}$  is a vector taking values 1 if the household reported an expected price change below 2 percent, value 0 otherwise;  $X_h$  is a vector of household background characteristics (gender, age, education, household

composition, being the financially knowledgeable person);  $Z_{ht}$  is a vector of macroeconomic variables (CPI, unemployment rate, GDP growth);  $Year$  is a year trend running from 2008 until 2014;  $\epsilon$  is an unobserved error term. We estimate model (1) by panel probit estimator with random effects. The choice of a probit model is motivated by the fact that the ECB inflation target of 2 percent represents an anchoring role in individual expectations, given the way it is communicated to the public in multiple occasions. We keep the probit model also to estimate house price expectations mostly for comparability with the expectations on prices in general, even if the ECB inflation target is in principle unrelated to real estate prices.

We then model expectations of household  $h$  at calendar year  $t$  for both prices in general, aggregate real estate prices and the prices of the own house as follows:

$$Y2_{ht} = \alpha X_h + \beta Z_t + \gamma Year_t + \epsilon_{ht} \quad (2)$$

where  $Y2_{ht}$  is a vector of reported expected price changes;  $X_{ht}$  is a vector of household background characteristics (gender, age, education, household composition, being the financially knowledgeable person);  $Z_{ht}$  is a vector of macroeconomic variables (inflation rate, unemployment rate, GDP growth and house price index<sup>3</sup>);  $year$  is a year trend;  $\epsilon$  is an unobserved error term. We estimate model (2) by panel OLS estimator with random effects.

The choice to perform the probit analysis first, and the OLS analysis afterwards comes from the idea of having a more general qualitative sense of the direction of inflation expectations around the ECB target. Ideally we want to investigate whether there is any sign of anchoring at the 2-percent level. Model (1) allows to fix a “critical value” to play the role of the anchor. Further analysis is then implemented in order to become more specific about how low/high inflation expectations are.

Following the literature on the effect of demographic variables on inflation expectations, we expect that older respondents, females, singles, individuals with no children, those with low education and those who are not the financially knowledgeable respondents in the household report higher inflation rates. Therefore we expect a negative sign in model (1) and a positive sign in model (2) for each of the above mentioned background characteristics.

In our models we use some macroeconomic variables as well. The main purpose to include these variables is to control for some macroeconomic factors affecting individual inflation expectations. However, we refrain from putting too much emphasis on their coefficients in view of the short sample period covering the years between 2008 and 2014, the low variation and the multicollinearity. Both inflation (CPI) and the real state prices for the Netherlands are obtained from the Statistical Bureau of the Netherlands. Unemployment and GDP growth rates are obtained from AMECO.

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<sup>3</sup>In this paper we use the expressions “real state prices” and “house price index” interchangeably.

In order to detect whether individuals recognize periods of deflation and whether they update their inflation expectations we include a year trend in the model. During the period between 2008 up to 2014 inflation has shown ample swings but a clear downward trend. Since the number of respondents reporting low inflation expectations increases over time, we expect the year trend to be positively estimated in model (1), and negatively estimated in model (2).

In addition, the longitudinal component of our data allows to estimate the second model described above in terms of deviations between the subjectively reported inflation expectations and realized inflation. Therefore we estimate the following model for each of the three inflation measures considered so far:

$$Y2_{ht}^* = \alpha X_h + \beta Z_t + \gamma Year_t + \epsilon_{ht} \quad (3)$$

where  $Y2_{ht}^*$  represents the vector of the differences between individual inflation expectations and the realized inflation. These deviations may be interpreted as a proxy for a forecast error, broadly speaking. With these models we aim at investigating whether any subgroup of the sample population is better at predicting inflation, and what the main determinants of this inflation subjective bias most likely are.

### 3. The data

The analysis in this paper is based on data collected from households participating in the DNB Household Survey (DHS). The DHS is an annual panel survey of more than 2,000 households in the Netherlands that started in 1993. The panel is run at Tilburg University by CentERdata and sponsored by De Nederlandsche Bank. Panel members are aged 16 years and older. In case of attrition, CentERdata recruits new participants to maintain the panel size and to keep the panel as representative as possible on a number of relevant background characteristics such as age, gender, income, education, and region of residence. The DHS dataset further contains detailed information on employment status, pension arrangements, accommodation, wealth, as well as health status, and psychological concepts. The dataset thus provides the opportunity to combine both economic and psychological aspects of financial behavior.

#### 3.1. The dependent variables: measures of inflation expectations

This paper focuses on inflation expectations and their determinants.

We exploit three sets of questions available in the DNB Household Survey over the period 2008-2014 concerning **expectations about changes of prices in general in the next 12 months** (“*What do you think it is the most likely (consumer) prices increase over the next 12 months?*”), **expectations about changes of house price index in the next 2 years** (“*What price movement do you expect on the housing market in the next 2 years: increase, decrease, remain about the same?*” and “*How much percentage points a year do you expect housing prices will increase/decrease on average?*”), and **expectations about changes**

**of own house prices in the next 2 years** (“*What price movement do you expect on your own house in the next 2 years: increase, decrease, remain about the same?*” and “*How much percentage points a year do you expect your own house price will increase/decrease on average?*”).

These questions were introduced starting from 2008 onwards, therefore our analysis covers the period 2008-2014 and not the entire panel starting from 1993. The first measure of inflation expectation we focus upon comes from the prices in general question. Please note that this question is framed in terms of price increases. This question characteristic may influence respondents’ inflation expectations and prompt them towards positive price changes rather than negative ones. Another question characteristic is that respondents are limited to give answers between 0 and 10 percent.

For each year we split our sample into three subgroups, depending on whether they reported to expect prices in general to be higher, about the same, or lower than the ECB inflation target of 2 percent. The choice of the 2 percent target is arbitrary, but it seems that the general public knows this inflation target better than other monetary policy objectives by the ECB (Cruisjen et al., 2010). Figure 3 reports how the number of respondents in each subgroup evolves over time. We also report the realized CPI inflation rate for the Netherlands. We can see that the line indicating the number of respondents saying inflation will be equal to 2 percent is moving in the opposite direction of the dots referring to realized inflation in the Netherlands. The same holds true for the line indicating the fraction of respondents saying inflation will be lower than 2 percent. In other words, the respondents are able to identify periods of lower inflation in the economy. However, this group of respondents is less numerous than the group of respondents saying inflation will be higher than 2 percent. In order to better visualize how individual expectations about changes of prices in general have evolved during the period considered in this paper, Figure 4 reports the density of the expected increase for the year 2008, for the year 2014, and for the entire period 2008-2014. The figure clearly shows two spikes at 3 percent in 2008 and at 2 percent in 2014. This suggests that the respondents have shifted their inflation expectations downwards between 2008 and 2014, therefore picking up the right direction of price movements. At the same time the figure suggests that individual expectations are still very much anchored at the 2 percent level.

*Figure 3 and Figure 4 about here*

We further exploit the question on prices in general and construct a discrete variable with expected changes.

The second measure of inflation expectations we consider is based on the housing market prices question. The time horizon is now different from the previous inflation expectation measure (two years rather than 12 months). Please note that this question and the following question are asked to home owners only. For each year we split our sample again into three subgroups, depending on whether they reported to expect real estate prices to increase, remain about the same, or decrease. Figure 5 reports how the fraction of

respondents in each subgroup evolves over time. We also report the realized changes in the house price index for the Netherlands. Except for the year 2010, the fraction of respondents saying the prices of the housing market will decrease continuously increased between 2008 and 2012. The fraction of respondents saying the prices will increase was very close to zero between 2009 and 2013. The fraction of respondents saying prices will be constant was relatively stable. This figure suggests that the respondents are more pessimist about movements in real estate prices than those about prices in general, although this difference could be the result of framing the questions differently.

We further exploit the question on housing market prices and construct a discrete variable with expected changes, restricted in the range between -50 and +50 percent (3 observations are deleted).

*Figure 5 about here*

The third indicator of inflation expectations comes from the questions on the price movements for the respondent's own house. As for the previous measure, by definition this inflation expectation measure is available for the subsample of homeowners only. Figure 6 reports the dynamics of the fraction of respondents in each subgroup over the period considered. We also report the realized changes in the House Price index for the Netherlands. The picture for changes in own house price expectations is rather similar to the previous one on housing market. However, the two pictures diverge as the difference between the number of respondents reporting decreasing and increasing prices for own house is smaller than the same corresponding difference for housing prices. This suggests that individuals are more optimistic about their own properties, and this finding is in line with the "endowment effect" and the "status syndrome" effects. The endowment effect is the tendency for people to overvalue what they own (Thaler (1980), Knetsch (1989) and Kahneman et al. (1990)) and is a direct consequence of loss aversion. The status syndrome is the tendency of those who are better off - in terms of income, home value, or reported health - to display a larger reported-actual price discrepancy than others Marmot (2004).

*Figure 6 about here*

### *3.2. The independent variables*

Table 1 reports the summary statistics of the variables we use throughout the paper.

The age of the respondents in our sample ranges from 16 to 94 years (mean age is 53.1 years). The age classes including respondents between 31 and 45 years, and older than 65 years are the mostly represented (24.6 percent each), followed by the one including respondents between 56 and 65 years (23.9 percent) and between 46 and 55 years (17.8 percent). The least represented age class includes the respondents less than 31 years (9 percent). Men and women are rather equally represented (women account for 45.6 percent). As for household composition, the average number of dependent children is slightly less than 1 (0.71); 78.2 percent

of the respondents are married or living with a partner. About two thirds of the sample declares to be the financially knowledgeable person in the household (66.4 percent). The education level of the respondents in our sample ranges from basic education up to university level. The pre-vocational education and vocational college are the mostly represented (26 percent each), followed by senior vocational training (17 percent) and university education (14 percent). The least represented educational level are pre-university education (11 percent) and primary education (4 percent). We also considered geographical information and controlled for regional dummies and for the degree of urbanization, but the insignificant role played by these variables in all estimations lead to the decision to not include them in the models shown here.

In order to control for macroeconomic movements, we include a few macroeconomic variables in the estimation of the models, although the focus of the study is on individuals' effects. The average CPI change in the Netherlands over the 2008-2014 period was 1.86 percent, the housing price index change was -2.35 percent, the unemployment rate was 5.57 percent, and GDP growth was about zero (0.021 percent). It is worth noting that the period covered in this study has an unusually low average GDP growth, as GDP growth is historically closer to 1.5-2% in more typical years.

*Table 1 about here*

#### 4. Empirical findings

This section reports the empirical findings related to inflation expectations in levels and in deviations from realized inflation.

##### 4.1. Inflation expectations in levels

We estimate model (1) for whether changes in **prices in general** are expected to be below the ECB 2-percent target rate in the next twelve months using panel probit. Table 2 reports the estimates for three specifications. Regression (I) considers an year trend and individual microeconomic variables only; regressions (II) to (III) control for additional macroeconomic variables. In all specifications we find a significant (at the 1-percent level) and positive year effect, meaning that in more recent years the respondents have recognized the declining trend of inflation. The marginal effect is very small in specification (I) (0.3 percentage points), and it increases once macroeconomic variables are added (3 percentage points in both specifications (II) and (III)). Females significantly (at the 1-percent level) expect changes in prices in general to be below 2 percent more likely than males in all specifications. The marginal effect is around 1.6 percentage points. We also find a significant age effect in all specifications. Age classes are jointly significant at the 1-percent level<sup>4</sup>. All macroeconomic variables are estimated significantly, at the 1-percent level. Lags of

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<sup>4</sup>In all models the age classes are jointly significant at the 1-percent level. The results of the tests are available upon request.

inflation are positive (their marginal effects range between 5 and 10 percentage points); unemployment rate and GDP growth are negative (their marginal effects are 8 and 0.6 percentage points, respectively). The results are partly in line with the literature on the effect of demographics of inflation expectations (e.g. Bruine de Bruin et al. (2010)) since some of the variables such as education and having a partner are not significant. Also the variable measuring whether the respondent is financially knowledgeable is not significant.

*Table 2 about here*

We further analyze changes in prices in general by estimating model (2) through the percentages reported by the survey respondents. Table 3 presents two regressions: the first one corresponds to the full range of responses reported; the second one focuses on inflation between 1 and 4 percent. The decision to focus on inflation between 1 and 4 percent is driven by the need to consider realistic expected inflation rates and therefore disregarding potential outliers in the sample. In both specifications the year trend is estimated significantly (at the 1-percent level) and with negative coefficients, suggesting again that the respondents recognized declining prices in most recent years. Gender and age are significant (at the 1-percent level) in specification (2) only: males and older individuals report higher levels of inflation. We also find a significant (at the 1-percent level) role for education: highest education attainments are positively correlated to lower levels of inflation expectations. CPI inflation lags and unemployment rates are significantly and negatively related to expected price changes. GDP growth is significant (at the 1-percent level) and positive in specification (2). The results are partially consistent with the literature. While for example Easaw et al. (2012) suggest female report higher inflation, we find the opposite effect. The same holds for educational level. A potential explanation could be related to the particular time span considered in our study, characterized by historically low GDP growth rates, unconventional monetary policies and low interest rates.

All the significant variables exhibit the opposite effect in Table 3 when compared to the results in Table 2. These results are coherent as they are influenced by the definitions of our dependent variables. The dummy dependent variable in the probit model indicates a value of inflation expectations below 2 percent. In the OLS model, the higher the dependent variable, the higher the expectation of inflation. In addition, the two models are consistent in terms of findings, as they highlight both the gender and the age effect. Model (2) better captures the role of education and that of the financially knowledgeable persons, likely in view of the nature of the dependent variable analyzed (reported inflation rates between 1 and 4 percent versus below/above 2 percent). It is interesting to note that the financially knowledgeable dummy becomes insignificant in the restricted sample: apparently this dummy helped to filter out the outliers in the full sample.

*Table 3 about here*

We then repeat the analysis for expected changes in **aggregate real estate prices**. Table 4 reports the results for model (1). The year effect is negative and insignificant in regression (I), positive and significant at the 1-percent level in regression (II) and in regression (III). This finding suggests the importance to control for macroeconomic variables in our regressions. The only microeconomic variable that turns out to be significant in all regressions is age. Lags of changes in the housing index are significant at the 1-percent level, with marginal effects ranging between 2 and 8 percent. Unemployment rate is also significant (at the 1-percent level) and the corresponding marginal effect is 18 percentage points in regression (II) and 36 percentage points in regression (III). The positive coefficient suggests that higher levels of unemployment lead to expectations of real estate price changes below 2 percent, but we refrain from inferring any causal effect from this finding. GDP growth is significant at the 1-percent level and the marginal effect is 10 percentage points.

*Table 4 about here*

A slightly different analysis is conducted for expected changes in **aggregate real estate prices** and **prices of the own house**. In particular, we do not consider the 2-% ECB target as relevant for this type of expectations, given that the price movement of a particular house could be more affected by other (regional) factors than by official inflation targets. In addition, the real estate price is a relative price (for one durable consumption good) as opposed to a general price level which measures the average price change of all goods and services. Since real estate is a durable asset, its price variation can be much larger than for goods and services. For all these reasons we do not estimate model (1) for these inflation expectation indicators, but model (2) only . When looking at the range of expected percentage changes people reported for housing market prices (see Table 5), we distinguish between total percentages (specification (I)), percentages positive or constant (specification (II)) and negative percentages (specification (III)). This way we inspect how individual expectations vary across micro and macroeconomic variables and whether individuals who expect negative inflation changes have some personal characteristics that differ from those of the respondents who expect positive inflation changes. We observe that the year effect is strongly significant in all specifications, and with a negative coefficient, indicating that for more recent years the inflation expectations have been falling. This finding suggests that in most recent years individuals were aware of the steep decline that housing prices had experienced after 2009 in the Netherlands. At the same time the respondents were not very pessimistic, as the last column suggests less scope for negative values. We also observe an age effect, so that older individuals report significantly lower housing prices expectations. However, this age effect is not robust when negative inflation expectations are considered. The lags of changes in the housing index are significant at the 1-percent level, and so is the unemployment rate. The GDP growth rate is significant at the 1-percent level in all regressions, suggesting that higher economic growth perspectives are positively correlated with better developments of housing prices. It is worth noticing that the individuals with the

highest level of education report significantly (at the 10-percent level, though) more negative inflation expectations. Therefore, higher education levels is associated with lower inflation expectations, more in line with the most recent developments of the economic environment.

*Table 5 about here*

Table 6 reports the estimates for expected changes in the own house price, where, as earlier in the paper, we distinguish between total percentages (specification (I)), positive or constant percentages (specification (II)) and negative percentages (specification (III)). The year trend is significant at the 1-percent level and negative for the total sample of home owners and for the subsample of respondents expecting positive or constant price changes. There is also a significant age effect: older individuals tend to report lower expected price changes than younger individuals. However, this effect is not significant when negative inflation expectations are considered, in line with the findings in Table 5. We also observe a significant (at the 1-percent level) gender effect for the subsample of homeowners reporting positive or constant price movements. This finding is consistent with the literature on gender and inflation expectations. The role of education highlighted above is robust in this set of regressions: higher education levels lead to lower inflation expectations. The house price index changes and the GDP growth are also significant determinants of own house price change expectations. Overall, the effects from Table 6 are consistent with the results obtained from the estimations using housing prices in general. However, the results for female and second lag of house price index changes are not significant in the negative expectations group for own house prices expectations. This possibly indicates that households tend to be more positive about the dynamics of their own house's price as the model lose some of its power for negative own house prices expectations.

*Table 6 about here*

#### *4.2. Inflation expectations in deviations from realized inflation*

An alternative way to look at inflation expectations is to validate them, that is to see whether individuals predict inflation right. Our data allow us to do that, given the longitudinal dimension of the data used in this paper. We therefore estimate a model that has as dependent variable the deviations of expectations from realizations for each of the inflation measures considered so far, e.g. prices in general, aggregate real estate prices and prices of the own house. Besides validation, these models allow to investigate the factors that contribute to the deviations between expectations and realization. Table 7 reports the results from this alternative set of models. In all regressions we control for the same macroeconomic variables that we included in the previous set of models. On top of individual background characteristics, macroeconomic variables play a significant role in explaining deviations between expectations and deviations, but it is difficult to give a clear cut interpretation to the estimated coefficients. Therefore we do not report them explicitly.

We find a strongly significant (at 1-percent level) year effect. The negative estimated coefficient implies that in more recent years the deviation between expected and realized inflation has reduced. This finding is robust across the three concepts of inflation we considered. Whether this is due to a learning effect is hard to argue. There is however some evidence that the respondents with the highest level of education or those who are the financially knowledgeable persons in the household are also the ones who report their inflation expectations significantly (at the 1-percent and at the 10-percent level, respectively) more in line with actual inflation. This evidence is found for prices in general only, though. In addition, we also find a significant age effect: older respondents are significantly more able to predict realized inflation than younger individuals. This holds for house prices and for the price of own house. The presence of a significant age effect is in line with Malmandier and Nagel (2016) who find that young individuals update their expectations more strongly in the direction of recent surprises than older individuals since recent experiences make up a larger part of their lives so far.

*Table 7 about here*

## **5. Conclusions**

This paper provides new evidence on individual inflation expectations based on questions posed in the DNB Household Survey for the years between 2008 and 2014 in the Netherlands. Three alternative indicators of inflation expectations are considered, namely changes in (consumer) prices in general in the next twelve months, changes in the aggregate real estate price in the next two years, and changes in the price of the own house in the next two years. These measures allow us to study whether and how individuals form different expectations for different price indexes.

The time span analyzed in this paper, characterized by inflation swings and unusually low inflation rates, is challenging for consumers to form their expectations. For each inflation expectations indicator we have shown their dynamics over time and how they compare with official inflation statistics, like the ones based on the consumer price index and the house price index. We have then estimated empirical microeconomic models in which macroeconomic variables and a year trend are also included to take common factors affecting individual expectations into account.

The main findings of our paper can be summarized as follows. Inflation expectations adjust slowly to realized inflation and there is modest evidence of deflation in the period considered in our analysis. Individuals better assess the dynamics of market housing prices than that of prices in general. We find a strongly significant year effect. This suggests that in more recent years the respondents have picked up the declining trend of inflation. The main determinants of low (or even negative) inflation expectations are gender and age together with macroeconomic factors such as actual lagged inflation and unemployment. The effects of the macroeconomic variables are often stronger than the effects of demographic characteristics.

We find a strongly significant year effect also when we study inflation expectations in terms of deviations from realized inflation. The empirical evidence shows that in more recent years the deviation between expected and realized inflation has reduced. Whether this is due to a learning effect is hard to argue. Older respondents, those with higher levels of education, and the financially knowledgeable persons in the household turn out to be the respondents whose inflation expectations are closer to realized inflation. This paper highlights that individual inflation expectations are still pretty well anchored at the 2-% ECB target level. Whether this is due to the credibility of monetary policy, or to an optimistic view of price dynamics, or simply to persistently wrong expectations remains an open question to both policy makers and academics, and is left for future research.

## References

- Armantier, O., W. Bruine de Bruin, S. Potter, G. Topa, W. van der Klaauw, and B. Zafar (2013). Measuring inflation expectations. *Annu. Rev. Econ.* 5(1), 273–301.
- Berben, R. P. and A. Stokman (2015). Does deflation affect household spending? The case of the Netherlands. *Applied Economics Letters*, 1–5.
- Berk, J. M. (2002). Consumers’ inflation expectations and monetary policy in Europe. *Contemporary Economic Policy* 20(2), 122–132.
- Bruine de Bruin, W., W. van der Klaauw, J. S. Downs, B. Fischhoff, G. Topa, and O. Armantier (2010). Expectations of inflation: The role of demographic variables, expectation formation, and financial literacy. *Journal of Consumer Affairs* 44(2), 381–402.
- Bryan, M. F. and G. Venkatu (2001). *The demographics of inflation opinion surveys*. Federal Reserve Bank of Cleveland, Research Department.
- Burke, M. A. and M. Manz (2014). Economic literacy and inflation expectations: Evidence from a laboratory experiment. *Journal of Money, Credit and Banking* 46(7), 1421–1456.
- Case, K. E., R. J. Shiller, and A. K. Thompson (2014). What have they been thinking? Homebuyer behavior in hot and cold markets, a 2014 update. *Cowles Foundation Discussion Paper No. 1876R*.
- CBS (2016). Price inflation international. <http://www.cbs.nl/en-GB/menu/themas/prijzen/cijfers/extra/inflatie-internationaal.htm>.
- Christiano, L. J., M. Eichenbaum, and C. L. Evans (2005). Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of Political Economy* 113(1), 1–45.
- Clark, T. E. and T. Davig (2008). An empirical assessment of the relationships among inflation and short-and long-term expectations. *Federal Reserve Bank of Kansas City, RWP 08-05*.
- Crujisen, C. v. d., D. J. Jansen, and J. De Haan (2010). How much does the public know about the ECB’s monetary policy? Evidence from a survey of Dutch households. *De Nederlandsche Bank, Working Paper 252*.
- Easaw, J., R. Golinelli, and M. Malgarini (2012). Do households anchor their inflation expectations? Theory and evidence from a household survey. *Working Paper 842, University of Bologna*.
- Englander, A. and G. Stone (1989). Inflation expectation surveys as predictors of inflation and behaviour in financial and labor markets. *Federal Reserve Bank of New York Quarterly Review Autumn*, 20–32.
- Galati, G., S. Poelhekke, and C. Zhou (2011). Did the crisis affect inflation expectations? *International Journal of Central Banking* 7(1), 167–207.
- Garcia, J. A. (2003). An introduction to the ECB’s survey of professional forecasters. *ECB Occasional Paper* (8).
- Hobijn, B., G. Topa, K. Mayer, and C. Stennis (2009). Whose inflation is it? Household level vs. aggregate measures of inflation. *Manuscript, Federal Reserve Bank of New York*.
- Ichiue, H. and S. Nishiguchi (2015). Inflation expectations and consumer spending at the zero bound: micro evidence. *Economic Inquiry* 53(2), 1086–1107.
- Kahneman, D., J. L. Knetsch, and R. H. Thaler (1990). Experimental tests of the endowment effect and the coase theorem. *Journal of Political Economy*, 1325–1348.
- Knetsch, J. L. (1989). The endowment effect and evidence of nonreversible indifference curves. *The American Economic Review*, 1277–1284.
- Malmendier, U. and S. Nagel (2016). Learning from inflation expectations. *The Quarterly Journal of Economics, forthcoming*.
- Mankiw, N. G., R. Reis, and J. Wolfers (2004). Disagreement about inflation expectations. In *NBER Macroeconomics Annual 2003, Volume 18*, pp. 209–270. The MIT Press.
- Marmot, M. G. (2004). *The status syndrome: how social standing affects our health and longevity*. London: Bloomsbury, 2004.

Niu, G. and A. Van Soest (2014). House price expectations. *IZA DP No. 8534*.

Pfajfar, D. and E. Santoro (2008). *Asymmetries in inflation expectation formation across demographic groups*. University of Cambridge, Faculty of Economics.

Strobach, C. and C. van der Cruijsen (2015). The formation of European inflation expectations: one learning rule does not fit all. *De Nederlandsche Bank, Working Paper 472*.

Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behavior & Organization* 1(1), 39–60.

van den End, J. W. and C. Pattipeilohy (2015). Central bank balance sheet policies and inflation expectations. *De Nederlandsche Bank, Working Paper, 473*.

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Most likely (consumer) prices increase - next 12 months	2.881	1.549	1	10	12,481
Most likely housing market prices change - next 2 years	-1.126	3.708	-49	30	5,286
Most likely own house price change - next 2 years	-0.72	3.578	-45	20	5,162
Female indicator	0.456	0.498	0	1	12,481
Age - below 31 years	0.090	0.287	0	1	12,481
Age - between 31 and 45 years	0.246	0.431	0	1	12,481
Age - between 46 and 55 years	0.178	0.382	0	1	12,481
Age - between 56 and 65 years	0.239	0.427	0	1	12,481
Age - higher than 65 years	0.246	0.431	0	1	12,481
Number of children in the household	0.714	1.074	0	6	12,481
Partner present in the household	0.782	0.413	0	1	12,481
Highest level of education completed	4.773	1.527	1	7	12,481
Financially knowledgeable person in the household	0.664	0.472	0	1	12,481
Year	2011	2.040	2008	2014	12,481
Inflation rate	1.861	0.657	1	2.5	12,481
House price index (%)	-2.352	3.285	-6.57	3.02	12,481
Unemployment rate	5.569	1.328	3.7	7.4	12,481
GDP growth in NL	0.021	1.788	-3.3	2.08	12,481

Table 2: Changes in prices in general will be below 2 percent in next 12 months

VARIABLES	(I)	(II)	(III)
	Marg. effect	Marg. effect	Marg. effect
Year	0.0027** (0.0011)	0.030*** (0.0066)	0.048*** (0.0072)
Female	0.015*** (0.0057)	0.015*** (0.0056)	0.015*** (0.0056)
Age - between 31 and 45 years	-0.014 (0.0093)	-0.016* (0.0090)	-0.016* (0.0090)
Age - between 45 and 55 years	-0.020** (0.010)	-0.019** (0.0097)	-0.021** (0.0098)
Age - between 56 en 65 years	-0.048*** (0.010)	-0.047*** (0.010)	-0.049*** (0.010)
Age - higher than 65 years	-0.056*** (0.011)	-0.053*** (0.011)	-0.053*** (0.011)
Number of children in the household	0.0019 (0.0029)	0.0022 (0.0028)	0.0023 (0.0028)
Partner present in the household	0.0078 (0.0072)	0.0063 (0.0070)	0.0059 (0.0070)
Highest level of education completed	0.0011 (0.0019)	0.00048 (0.0019)	0.00068 (0.0019)
Financially knowledgeable person in the household	0.0076 (0.0064)	0.0064 (0.0062)	0.0064 (0.0062)
Inflation rate(t-1)		0.067*** (0.0062)	0.079*** (0.0065)
Inflation rate(t-2)		0.098*** (0.0080)	0.087*** (0.0078)
Unemployment rate		-0.082*** (0.012)	-0.15*** (0.016)
GDP growth in NL			-0.036*** (0.0046)
Observations	12,151	12,151	12,151
Number of id	4,000	4,000	4,000
Prob Chi2	0.00	0.00	0.00

<sup>1</sup> Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

<sup>2</sup> The dependent variable comes from the question "What do you think it is the most likely (consumer) prices increase over the next twelve months?" We construct a dummy variable taking value 1 if the change in price is reported to be lower than 2%.

Table 3: The most likely consumer prices change in the next twelve months

VARIABLES	(I)	(II)
	Total	Between 1 and 4
Year	-0.29*** (0.034)	-0.28*** (0.021)
Female	0.019 (0.042)	-0.056** (0.022)
Age - between 31 and 45 years	0.068 (0.065)	0.040 (0.036)
Age - between 45 and 55 years	0.10 (0.070)	0.13*** (0.039)
Age - between 56 en 65 years	0.084 (0.070)	0.16*** (0.039)
Age - higher than 65 years	0.27*** (0.074)	0.22*** (0.040)
Number of children in the household	-0.0066 (0.020)	-0.0084 (0.011)
Partner present in the household	-0.0074 (0.050)	0.031 (0.027)
Highest level of education completed	-0.11*** (0.014)	-0.017** (0.0074)
Financially knowledgeable person in the household	-0.088* (0.045)	-0.028 (0.024)
Inflation rate(t-1)	-0.27*** (0.032)	-0.28*** (0.020)
Inflation rate(t-2)	-0.45*** (0.037)	-0.40*** (0.023)
Unemployment rate	0.81*** (0.071)	0.76*** (0.044)
GDP growth in NL	0.21*** (0.020)	0.18*** (0.013)
Constant	577*** (68.1)	560*** (42.5)
Observations	12,151	10,740
R-squared	0.041	0.061
Number of id	4,000	3,754
Prob Chi2	0.00	0.00

<sup>1</sup> Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

<sup>2</sup> The dependent variable comes from the question "What do you think it is the most likely (consumer) prices increase over the next twelve months?"

Table 4: Housing prices will increase by less than 2 percent in the next two years

VARIABLES	(I) Marg. effect	(II) Marg. effect	(III) Marg. effect
Year	-0.0012 (0.0036)	0.62*** (0.035)	1.01*** (0.040)
Female	0.0067 (0.022)	0.018 (0.022)	0.042* (0.022)
Age - between 31 and 45 years	0.022 (0.058)	-0.0037 (0.057)	0.0019 (0.058)
Age - between 45 and 55 years	0.17*** (0.058)	0.14** (0.058)	0.14** (0.058)
Age - between 56 en 65 years	0.20*** (0.057)	0.17*** (0.056)	0.16*** (0.057)
Age - higher than 65 years	0.20*** (0.057)	0.17*** (0.057)	0.17*** (0.057)
Number of children in the household	0.00067 (0.010)	0.0022 (0.0100)	0.0042 (0.010)
Partner present in the household	0.0049 (0.024)	0.0034 (0.024)	0.017 (0.024)
Highest level of education completed	0.0044 (0.0061)	0.0053 (0.0061)	0.0051 (0.0062)
Financially knowledgeable person in the household	0.0096 (0.022)	0.0057 (0.022)	0.00069 (0.022)
House price index (%) (t-1)		0.039*** (0.0044)	0.12*** (0.0051)
House price index (%) (t-2)		0.11*** (0.0075)	0.17*** (0.0078)
Unemployment rate		-0.53*** (0.035)	-1.13*** (0.045)
GDP growth in NL			-0.30*** (0.014)
Observations	4,956	4,956	4,956
Number of id	1,650	1,650	1650
Prob Chi2	0.00	0.00	0.00

<sup>1</sup> Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

<sup>2</sup> The dependent variable uses the following two questions: "What kind of price movement do you expect on the housing market in the next two years: will the housing prices increase, decrease or remain about the same? How much percentage points a year will they increase/decrease on average?" We construct a dummy variable taking value 1 if the change in price is reported to be lower than 2% (including negative values).

Table 5: Expectations about housing price changes in the next two years

VARIABLES	(I)	(II)	(III)
	Total	Positive or constant	Negative
Year	-6.64*** (0.29)	-1.91*** (0.18)	-1.72** (0.71)
Female	-0.21 (0.14)	-0.29*** (0.10)	0.52** (0.26)
Age - between 31 and 45 years	-0.36 (0.35)	-0.33 (0.21)	-0.085 (0.83)
Age - between 45 and 55 years	-1.27*** (0.36)	-0.49** (0.22)	-0.84 (0.83)
Age - between 56 en 65 years	-1.35*** (0.35)	-0.63*** (0.21)	-0.61 (0.82)
Age - higher than 65 years	-1.44*** (0.35)	-0.63*** (0.22)	-0.63 (0.82)
Number of children in the household	-0.0072 (0.063)	0.0063 (0.045)	-0.0058 (0.11)
Partner present in the household	-0.13 (0.15)	-0.0075 (0.11)	-0.096 (0.27)
Highest level of education completed	0.0029 (0.038)	-0.033 (0.029)	0.12* (0.067)
Financially knowledgeable person in the household	-0.055 (0.14)	-0.040 (0.100)	0.061 (0.25)
House price index (%) (t-1)	-0.90*** (0.043)	-0.20*** (0.026)	-0.41*** (0.083)
House price index (%) (t-2)	-1.15*** (0.058)	-0.31*** (0.035)	-0.42*** (0.13)
Unemployment rate	7.26*** (0.32)	2.41*** (0.18)	1.36 (0.85)
GDP growth in NL	2.18*** (0.097)	0.75*** (0.056)	0.82*** (0.24)
Constant	13,304*** (589)	3,836*** (361)	3,436** (1,415)
Observations	4,956	3,303	1,653
R-squared	0.14	0.075	0.041
Number of id	1,650	1,456	863
Prob Chi2	0.00	0.00	0.00

<sup>1</sup> Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

<sup>2</sup> The dependent variable is derived from the following two questions: "What kind of price movement do you expect on the housing market in the next two years: will the housing prices increase, decrease or remain about the same? How much percentage points a year will they increase/decrease on average?" We construct a variable with values between -50 and +50 percent.

Table 6: Expectations about own house prices changes in the next two years

VARIABLES	(I)	(II)	(III)
	Total	Positive or constant	Negative
Year	-4.80*** (0.28)	-1.91*** (0.18)	-1.18 (1.00)
Female	-0.25* (0.15)	-0.40*** (0.10)	0.31 (0.31)
Age - between 31 and 45 years	-0.45 (0.36)	-0.68*** (0.22)	0.94 (1.10)
Age - between 45 and 55 years	-1.33*** (0.37)	-0.95*** (0.23)	0.23 (1.09)
Age - between 56 en 65 years	-1.51*** (0.36)	-1.07*** (0.23)	0.14 (1.07)
Age - higher than 65 years	-1.68*** (0.36)	-1.14*** (0.23)	-0.16 (1.07)
Number of children in the household	-0.045 (0.067)	-0.014 (0.046)	-0.12 (0.13)
Partner present in the household	0.045 (0.16)	0.0016 (0.11)	-0.23 (0.31)
Highest level of education completed	0.020 (0.041)	0.00074 (0.029)	0.18** (0.076)
Financially knowledgeable person in the household	0.0084 (0.14)	0.050 (0.10)	0.16 (0.29)
House price index (%) (t-1)	-0.59*** (0.041)	-0.16*** (0.025)	-0.35*** (0.11)
House price index (%) (t-2)	-0.62*** (0.057)	-0.28*** (0.037)	-0.13 (0.18)
Unemployment rate	6.34*** (0.30)	2.43*** (0.19)	1.95 (1.21)
GDP growth in NL	1.95*** (0.094)	0.66*** (0.058)	1.07*** (0.35)
Constant	9,611*** (562)	3,823*** (363)	2,347 (2,010)
Observations	4,832	3,586	1,246
R-squared	0.12	0.067	0.035
Number of id	1,628	1,503	668
Prob Chi2	0.00	0.00	0.00

<sup>1</sup> Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

<sup>2</sup> The dependent variable is derived from the following two questions: "What kind of price movement do you expect on your own house in the next two years: will the price increase, decrease or remain about the same? How much percentage points a year will it increase/decrease on average?" We construct a variable with values between -50 and +50 percent.

Table 7: Deviations from actual inflation and actual housing prices

VARIABLES	(I) Inflation	(II) House Prices	(III) Own House Prices
Year	-1.03*** (0.036)	-4.70*** (0.30)	-2.79*** (0.29)
Female	0.035 (0.042)	-0.16 (0.16)	-0.19 (0.17)
Age - between 31 and 45 years	0.069 (0.066)	-0.44 (0.41)	-0.44 (0.42)
Age - between 45 and 55 years	0.057 (0.071)	-1.30*** (0.41)	-1.27*** (0.42)
Age - between 56 en 65 years	0.0051 (0.071)	-1.42*** (0.40)	-1.50*** (0.41)
Age - higher than 65 years	0.21*** (0.074)	-1.52*** (0.41)	-1.67*** (0.42)
Number of children in the household	-0.011 (0.021)	0.0089 (0.072)	-0.029 (0.076)
Partner present in the household	-0.020 (0.051)	-0.074 (0.17)	0.16 (0.18)
Highest level of education completed	-0.10*** (0.014)	-0.00012 (0.043)	0.018 (0.046)
Financially knowledgeable person in the household	-0.088* (0.046)	0.0062 (0.15)	0.081 (0.16)
Constant	2,056*** (71.2)	9,477*** (607)	5,628*** (579)
Observations	12,151	4,223	4,099
R-squared	0.14	0.58	0.55
Number of id	4,000	1,496	1,474
Prob Chi2	0.00	0.00	0.00

<sup>1</sup> Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

<sup>2</sup> The dependent variable is defined as the difference between actual price change and its corresponding expectation.

Figure 1: Inflation rate in the Netherlands and in the Eurozone

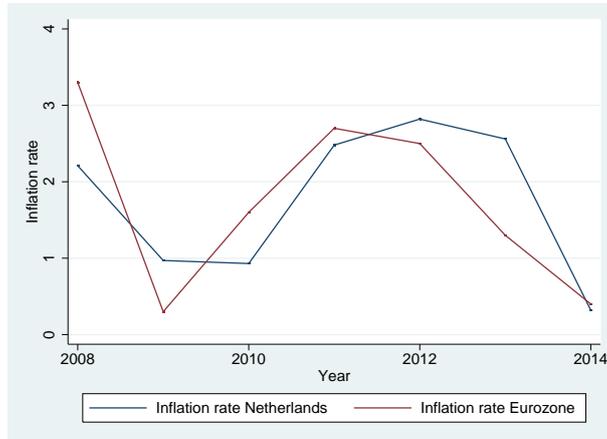


Figure 2: Inflation rate and house price index in the Netherlands

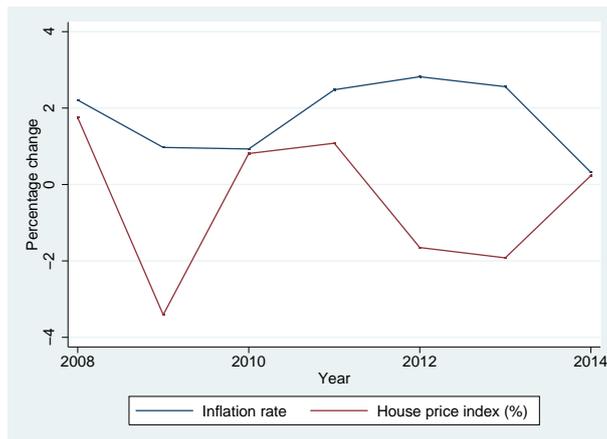


Figure 3: Number of respondents reporting inflation will be higher, lower or equal to 2 percent in the next 12 months

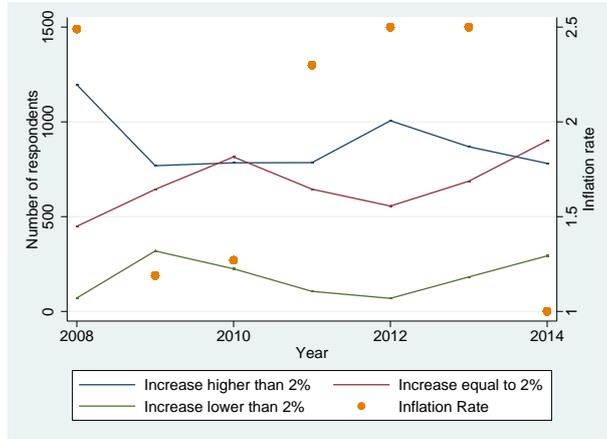


Figure 4: Density of expected increase in general price by year

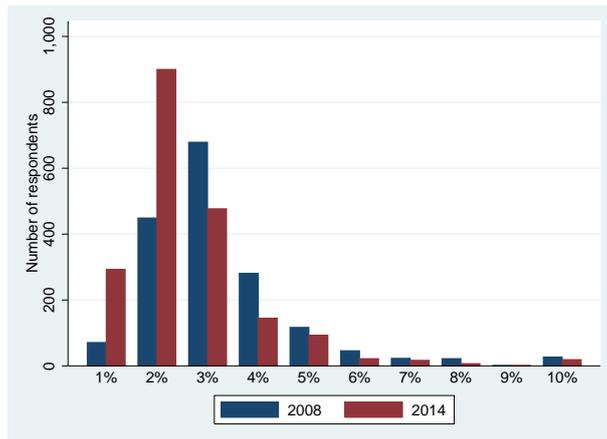


Figure 5: Number of respondents reporting housing prices will increase, decrease or remain the same in the next two years

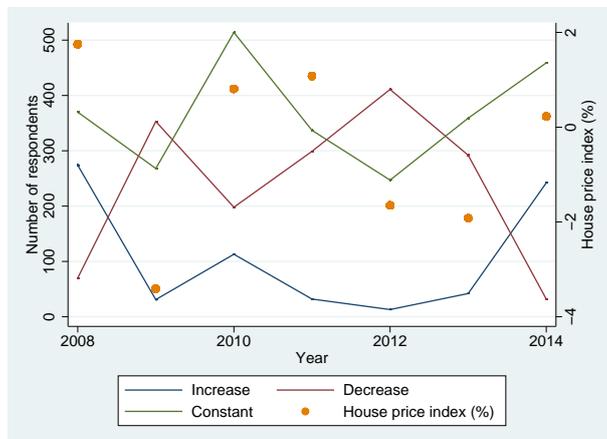
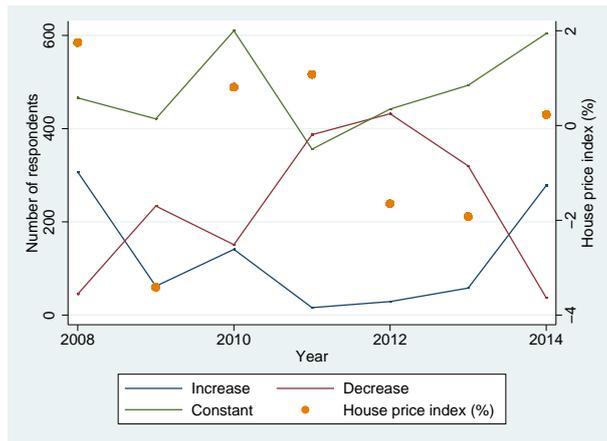


Figure 6: Number of respondents reporting own house prices will increase, decrease or remain the same in the next two years



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