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Measuring expectations of inflation: Effects of survey mode, wording, and opportunities to revise*

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Abstract

Several national consumer surveys aim to elicit consumers' inflation expectations. Median reported expectations have been shown to track objective inflation estimates over time, although respondents display relatively large disagreement. Observed medians, however, tend to differ between consumer surveys, possibly reflecting survey design differences. In this paper, we examine the importance of three survey features in explaining these differences: question wording ('prices in general' vs. 'inflation'), interview mode (face-to-face vs. web), and the explicit opportunity to revise responses. We find systematic effects on item non-responses, reported inflation expectations and their dispersion. We discuss implications of our findings for survey design.

Keywords: Consumer surveys, inflation expectations, question wording, mode effects.

JEL Classifications: E31, D84.

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1. INTRODUCTION

Across the world, governments, central banks, research and financial institutions are investing considerable resources to survey consumers about their inflation expectations. Central banks that conduct national consumer surveys about inflation expectations include the Federal Reserve Bank of New York, the European Central Bank, the Bank of Australia, the Bank of Canada, and the Swedish Riksbanken (Armantier *et al.*, 2013a; Cunningham *et al.*, 2010). Together with market-based measures and surveys of businesses and professional forecasters, consumer surveys of inflation expectations are used by central banks to inform monetary policy decisions (Cunningham *et al.*, 2010; Gali, 2008). That practice is supported by the finding that consumers' inflation expectations track objective estimates of realized inflation (Ang *et al.*, 2007; Bryan & Venkatu, 2001; Hafer & Hein, 1985; Thomas, 1999), and inform consumers' actual financial behaviors (Armantier *et al.*, 2015). Indeed, inflation expectations are relevant to people's decisions about savings, investments, purchases of durable goods, and wage negotiations – which, in turn, affect economic activity and realized inflation.

The United States is one of the few countries where multiple consumer surveys of inflation expectations have been running simultaneously, including the Conference Board's Consumer Confidence Survey, the Reuters/University of Michigan Survey of Consumers, and the New York Federal Reserve's Survey of Consumer Expectations. Interestingly, these different consumer surveys show seemingly systematic variation in the reported medians and dispersion of year-ahead inflation expectations (Armantier *et al.*, 2013a). Relatively little is known about why these surveys yield different results. Although sampling procedures differ between surveys, the reported findings tend to be weighted to match focal demographic characteristics of the U.S. adult population. Reported medians may also differ between surveys as a result of variations in their treatment of outliers (e.g., Curtin, 1996).

In addition to variations in sampling and computations, it has been suggested that differences in survey design features may also contribute to discrepancies between the findings of consumer surveys (Armantier *et al.*, 2013a). One survey design feature that differs across US consumer

surveys of inflation expectations is the administration mode. The University of Michigan Surveys of Consumers use phone interviews (Ludvigson, 2004), the Conference Board's Consumer Confidence Survey sends paper-and-pencil questionnaires through the mail, (Ludvigson, 2004), and the New York Federal Reserve's Survey of Consumer Expectations is conducted online (Armantier *et al.* 2013b). A second survey design feature that differs between consumer surveys of inflation expectations is the question wording. The University of Michigan Survey of Consumers asks about expectations for changes in "prices in general" (Curtin, 1996), and the Conference Board's Consumer Confidence Survey asks about changes in "prices" (The Conference Board, personal communication, 2015), while the New York Federal Reserve's Survey of Consumer Expectations asks about expectations for "inflation" (Armantier *et al.*, 2013c). A third survey design feature that varies between surveys is whether or not participants receive an explicit opportunity to re-think and revise their answers. While surveys often allow participants to go back and change their answers, it is typically not explicitly encouraged. However, the University of Michigan Survey of Consumers provides respondents who have given an inflation expectation over 5% the explicit opportunity to re-think and revise their answer by asking "Let me make sure I have that correct. You said that you expect prices to go up during the next 12 months by [x%]. Is that correct?" (Curtin, 1996). In contrast, the New York Federal Reserve's Survey of Consumer Expectations and The Conference Board's Consumer Confidence Survey do not provide this explicit revision opportunity. Due to variations in recruitment and (unpublished) outlier treatment, it is has not yet been possible to identify the contribution of these survey design features to reported survey results.

In this paper, we focus on the role of these three specific survey features in explaining the variation in survey findings: administration mode, question wording, and the opportunity to revise. We test the effects of these survey design issues in a Dutch national sample, with participants being randomly assigned to different survey design features. Medians are computed with the same formula. Below, we review the survey design research on administration mode, question wording, and opportunities to revise, as well as the relevant literature on designing consumer surveys about inflation expectations.

1.1. Effects of administration mode: Interviewer vs. web

Traditionally, many consumer surveys involved interviewers who asked questions face-to-face or over the telephone. These interviewer-administered modes have shown remarkably few differences (Shuy 2002). More recently, economists have started to survey respondents over the internet, raising potential concerns about mode differences in reported findings. However, most changes in responding may not be due to the new mode but rather to a re-design of questions that is implemented to fit the new mode (Dillman & Christian, 2005).

A main difference between face-to-face and web surveys is the presence of an interviewer. One potential benefit of interviewer-administered modes is that interviewers can motivate participants and explain confusing questions (Conrad & Schober, 2000). Yet, interviewers may also introduce unwanted influences and errors when they deviate from standardized protocols (Groves & Magilavy, 1986). Furthermore, the presence of an interviewer may lead participants to edit their responses to what they deem to be more ‘appropriate’ (Chang & Krosnick, 2009; Dillman & Christian, 2005; Kreuter *et al.*, 2008; Parks *et al.*, 2006; Toureangeau & Yan, 2007). Classic examples show that participants are more likely to describe their health as ‘good’ and less likely to admit to drug use or other socially undesirable behaviors when talking to an interviewer than when answering a self-administered survey (Dillman & Christian, 2005).

Web surveys are self-administered, without the presence of an interviewer. Web participants can answer questions in private and at their own pace. Web surveys may therefore reduce concerns about socially desirable responding, as well as interviewer-related costs (Chang & Krosnick, 2009; Schonlau, *et al.*, 2003; Taylor, 2000). However, concerns have been raised about non-representative internet coverage (Fricker *et al.*, 2005). Additionally, people who are less proficient users of the internet tend to be less likely to participate in self-administered web surveys, as compared to self-administered postal surveys (Kwak & Radler, 2002; Sax *et al.*, 2003). To recruit individuals without internet access, some panels have offered free internet connections, Web TVs, and training to those individuals, thus alleviating potential concerns about sample representativeness (Schonlau *et al.*,

2009). Such strategies may become less necessary as internet use is becoming more common in all segments of the population.

Ultimately, the decision to collect data through internet surveys should be based on the relative costs and benefits of conducting internet surveys, compared to other modes. As people are becoming more computer literate and gain internet access, it will become increasingly feasible to use the internet as a mode for conducting economic surveys. According to the European Union, basic broadband was already available to all citizens in 2013, allowing for 100% internet coverage in every member state (European Union, 2015a). Fast internet is available to 98% of households in the Netherlands, where we conducted our research (European Union, 2015b). At the same time, response rates on telephone surveys appear to be falling (Curtin et al, 2005).

Yet, even among the growing numbers of internet users, it is possible that there will be mode differences in reported inflation expectations. Although there have been no studies of mode effects in consumer surveys about inflation expectations, studies in other domains have extensively compared telephone vs. face-to-face interviews, and web vs. mail surveys (Couper, 2011). Comparisons of self-administered online surveys with interviewer-administered surveys are relatively uncommon, and have suggested mode differences for various outcome measures (Couper, 2011; Fricker *et al.*, 2005). We highlight two findings that may contribute to mode effects in consumer surveys about inflation expectations, even when modes are received by comparable samples.

First, mode effects in willingness to answer questions about inflation expectations may produce differences in reported expectations. If online surveys promote higher item response rates, then even individuals who are uncertain about future inflation may provide a response, rather than choosing to skip the question. Those uncertain participants may be more likely to give a seemingly very high response (Bruine de Bruin *et al.*, 2011a), thus leading to higher inflation expectations with online surveys than with other modes. Some studies have indeed reported that online surveys actually yield better item response rates than telephone interviews, but this may be due to specific web surveys having included automated prompts that were absent from the telephone interviews (Fricker *et al.*, 2005; Link & Mokdad, 2005). The latter finding further underscores the importance of making

survey design comparable across modes, when conducting studies of potential mode differences (Dillman & Christian, 2005).

Second, as noted, research on mode effects has repeatedly shown that the presence of an interviewer may increase respondents' likelihood of giving socially desirable responses (Chang & Krosnick, 2009; Kreuter *et al.*, 2008; Toureangeau & Yan, 2007). In the context of inflation expectations, American studies have often treated responses over 5% as very high, because the US Consumer Price Index (CPI) has not been over 5% since 1990 (Bruine de Bruin *et al.*, 2010; 2011b; 2012). If interviewees are aware that reporting expectations over 5% is inconsistent with the CPI as well as the expectations reported by most others, either from their own experience or due to cuing from the interviewer, they may be more inclined than web survey respondents to provide inflation expectations that are lower.

1.2. Effects of question wording

The survey design literature recommends the use of question wordings that are easy for respondents to read, because doing so reduces the likelihood that participants will skip questions (Bassili & Scott, 1996; Knäuper, Belli, Hill, & Herzog, 1997; Yan & Toureangaeu, 2008). Such considerations may be particularly important when asking about financial topics that consumers already find difficult to answer. However, seemingly irrelevant changes that aim to simplify question wording can influence how people interpret questions and generate responses (Bruine de Bruin, 2011; Glaser *et al.*, 2007; Holleman, 1999; Loftus & Palmer, 1974; Rasinski, 1989). One notable example pertains to the questions about inflation expectations, which can be phrased to ask about 'prices in general,' or 'inflation' (Bruine de Bruin *et al.*, 2012). Although participants tend to rate the 'inflation' wording as more difficult (Bruine de Bruin *et al.*, 2012), they are familiar with the term and can give a reasonable definition (Leiser & Drori, 2005; Svenson & Nilsson, 1986; Williamson & Wearing, 1996). As compared to questions that use the simple 'prices in general' wording, questions that ask about 'inflation' produce less dispersion in reported expectations (Bruine de Bruin *et al.*, 2012).

The larger dispersion of reported expectations for ‘prices in general’ (vs. expectations for ‘inflation’) may partly reflect disagreements between participants about how to interpret the ‘prices in general’ question wording. Some participants recognize that the ‘prices in general’ wording refers to overall inflation, while others think of their personal price experiences (Bruine de Bruin *et al.*, 2010; 2012). Those who think of inflation tend to give systematically lower responses than those who think of personal price experiences (Bruine de Bruin *et al.*, 2010). Because individuals may purchase different products, it is reasonable to observe some dispersion in reported expectations for future prices (Hafer & Hein, 1985; Ranyard *et al.*, 2008). However, thoughts about personal price experiences tend to focus on especially on large price changes, such as those for gas, because those tend to be most salient (Bruine de Bruin *et al.*, 2012; Bruine de Bruin *et al.*, 2011b). As a result, participants may report expectations for ‘prices in general’ that seem relatively extreme, as compared to the Consumer Price Index or other indices of overall inflation (Bruine de Bruin *et al.*, 2010; 2011b; 2012).

1.3. Effects of the opportunity to revise responses

The survey design literature has suggested that survey respondents will provide answers to questions about unfamiliar or even fictitious topics (Bishop *et al.*, 1980; de Best-Waldhober *et al.*, 2009). Especially people with lower levels of education may feel pressure to give a response (Bishop *et al.*, 1980, 1986). Participants may also feel pressure to answer questions about inflation expectations, despite being unsure about how to respond. Participants who are more uncertain about their inflation expectations tend to have lower levels of education, and give responses that are more dispersed and variable over time (Bruine de Bruin *et al.*, 2011a). They are also more likely to give responses that are seemingly high (Bruine de Bruin *et al.*, 2010, 2011a). Perhaps as a result, the Michigan interview protocol (Curtin, 1996) requires that inflation expectations over 5% are followed up with “Let me make sure I have that correct. You said that you expect prices to go up during the next 12 months by [x%]. Is that correct?” The likely reason for 5% as a cut-off may be that the United States’ CPI has not been over 5% for decades (Bruine de Bruin *et al.*, 2012). If the prompt

leads participants to recognize that their high response is perceived as an error, then it may lead them to revise their answer to a lower number that is more in line with recent CPI.

Indeed, research on the self-administered Graduate Records Exam (GRE) has suggested that test takers who change their answer are more likely to switch from an incorrect answer to a correct answer than the other way around (Liu *et al.* 2015).¹ These conclusions hold for multiple-choice and true-false questions, for achievement and aptitude tests, and for computer-based and paper-and-pencil modes (Kruger *et al.*, 2005). Test takers with lower-level abilities tend to make more revisions, suggesting that they are more uncertain about their answers (Liu *et al.* 2015).

However, the GRE is a self-administered test that is completed either on a computer or on paper. It is possible that participants will feel less inclined to take the opportunity to revise their answers in the presence of an interviewer. As noted, people seek to make a positive impression on an interviewer (Chang & Krosnick, 2009; Parks *et al.*, 2006). Moreover, psychological research on decision making has shown that the presence (vs. absence) of another person can lead to so-called ‘defensive bolstering’ or amplification of commitment to previously expressed beliefs (Lerner & Tetlock, 1999). If so, participants may be more inclined to revise their answers in a self-administered than in an interviewer-administered survey mode.

1.4. Our research questions

Here, we conducted an experiment in which participants were randomly assigned to receive our survey in a face-to-face or web administration mode, after having agreed to participate in either mode.² Participants in each mode were randomly assigned to a question worded to ask for expectations of ‘prices in general’ or expectations for the ‘rate of inflation.’ All participants received the explicit opportunity to revise their answers. Our aim was to examine effects of our manipulations on the observed (1) item response rates for the expectations question; (2) percent of participants revising their reported expectations after receiving the revision prompt; (3) the central tendency of responses (4) the dispersion of responses, and (5) the percent of expectations over 5%. We also examined the role of participants’ demographic characteristics when examining each of these

variables. Of special interest was the role of participants' educational attainment, because this is a demographic characteristic that tends to be systematically negatively related to reporting inflation expectations that are higher, more dispersed and expressed with more uncertainty (Bruine de Bruin *et al.*, 2010, 2011a; Bryan & Venkatu, 2001).

2. METHOD

2.1. Timing of study

Our study was conducted in the Netherlands in April of 2014. Over 2013, the overall CPI inflation rate had been 2.5%, which signified no change from 2012 (Statistics Netherlands, 2015). During 2014, the overall CPI inflation would end up dropping to 1.0%, the lowest the Netherlands had experienced in more than 25 years (Statistics Netherlands, 2015). A press release by the Netherlands' Central Bureau of Statistics published on 10 April 2014 already noted this marked decrease in realized inflation (Statistics Netherlands, 2014). Because overall inflation had not been over 5% since it reached 6.0% in 1982, and not been over 3% since it reached 3.4% in 2002 (Statistics Netherlands, 2015), responses over 5% may seem very high (as in Bruine de Bruin *et al.*, 2010; 2011b; 2012).

2.2. Sample and procedure of the survey experiment

Participants were recruited from the Longitudinal Internet Studies for the Social Sciences (LISS) panel, which is conducted by CentERdata at the University of Tilburg (www.lissdata.nl). The panel reflects a true probability sample of households drawn from the national population registers. If needed, households were provided with a computer and internet connection. Their demographic information was collected at their entry to the panel, and updated through annual surveys. After joining the panel, participants received monthly electronic invitations to complete online surveys, including the one presented in this paper.

As recommended, we recruited all participants for our survey experiment in the same way (Fricker *et al.*, 2005). We contacted members of the LISS internet panel by asking them whether they were willing to complete our questions in either a self-administered web survey or a face-to-face

interview. In February of 2014, 4310 randomly selected panel members received an electronic invitation that stated: “An international team of researchers will conduct a LISS panel study to examine how people make financial decisions. For this study we are looking for people who are willing to talk to an interviewer in their home. About half of those who are interested will be randomly selected for an interview. If you are prepared to participate and you are selected for an interview, we will give your phone number to TNS-NIPO.³ The TNS-NIPO interviewer will make an appointment with you and visit you at the scheduled time to conduct the survey. The survey will take 20 minutes. Content will cover (dealing with) finances, lifestyle, and expectations for the future. The compensation is 15 euro⁴. Following LISS panel custom, this amount will be added to your bank account.” They were then asked whether they would agree to participate in a face-to-face interview in the month of April, with response options being “yes,” “no,” or “maybe but I want more information.” In March 2014, those who answered “maybe” received more information as well as the phone number of the help desk. Subsequently, they received a second request to indicate whether or not they would be willing to participate.

Of the 4310 panel members who were originally contacted, 3392 responded ‘yes’ or ‘no’ to our invitation to participate (78.7%). Of those 3392 responders, 1539 agreed to participate (45.4%). Among the 4310 who were invited, the 1539 who agreed to participate were no more likely to lack a college education or report low income ($p > .10$), the demographic characteristics most relevant to inflation expectations (Bruine de Bruin et al., 2010). However, the 1539 who signed up to participate were slightly older ($M = 54.2$, $SD = 16.4$ vs. $M = 51.7$, $SD = 16.0$), $t(4308) = -4.87$, $p < .001$, and more likely to be male (53.7% vs. 45.4%), $\chi(1) = 26.88$, $p < .001$ than the panel members who did not agree to participate.

The 1539 who agreed to participate were randomly assigned to the web mode ($n = 769$) or to the face-to-face mode ($n = 770$). Questions were worded and designed in the same way for each mode, so that any differences in responses would reflect mode differences rather than question differences (Dillman & Christian 2005). The web mode was administered through the LISS panel. The face-to-face mode was administered by trained interviewers from TNS-NIPO. Within each mode,

participants were also randomly assigned to receiving questions about ‘prices in general’ or ‘rate of inflation.’ Appendix 1 shows the ‘prices in general’ wording, which was adapted from the Michigan interview protocol (Curtin, 1996). The first question asked “Do you think that prices in general will increase, decrease, or stay the same over the next 12 months?” The next question depended on participants’ answers. Participants who answered “increase” or “decrease” were asked to indicate a percentage for that change. Participants who answered “the same” were asked to clarify whether they meant that prices would go up at the same rate, or would not go up during the next 12 months. Those who answered “increase at the same rate” were asked by what percent. All participants then received the opportunity to revise their answer by being asked “I would like to make sure I understood your answer. You said that you expect prices to go [up/down] by [x] percent. Is that correct? An answer of “no” would then trigger a repeat of the original question”⁵

Following the survey experiment by Bruine de Bruin *et al.* (2012), questions about ‘inflation’ followed the same pattern, so that the only difference with questions about ‘prices in general’ pertained to the wording. Appendix 2 shows the full set of questions. Participants were first asked whether they thought there would be “inflation, deflation (the opposite of inflation), or neither” during the next 12 months. Participants who answered “inflation” or “deflation” were asked to indicate a percent change. Participants who answered “neither” were asked to clarify whether they thought the inflation rate would be the same, or be zero, over the next 12 months. Those who answered “the same rate” were asked to indicate a percent change.

All participants received the opportunity to revise their answer: “I would like to make sure that I understood your answer. You said that you expect [inflation/deflation] to be [x] percent during the next 12 months. Is that correct?” We recorded initial as well as revised answers. As a result, the effect of the opportunity to revise could be examined by comparing responses provided initially and after the revision prompt.

2.3. Effects of mode on survey participation rates.

As noted, the 1539 panel members who signed up to participate were randomly assigned to the web mode ($n=769$) or to the face-to-face mode ($n=770$). Random assignment was successful, Table 1 shows that there were no differences in those who were assigned to the web mode and those who were assigned to the face-to-face mode, in terms of college education, income, gender, and age (each $p>.10$). On average, the signed-up sample was 54.19 years old ($SD=16.57$; range 18-91). In this sample, 46.3% were women. Median income after taxes was €1651 per month. The reported analyses will apply a median-split to this income variable, thus assigning 50% of participants to the low-income category (e.g., below €1651 monthly income after taxes). A total of 60.2% had no college education, which, as noted, is a demographic variable of interest because it tends to be systematically related to reporting inflation expectations that are higher, more dispersed, and expressed with more uncertainty (e.g., Bruine de Bruin *et al.*, 2011a).

Importantly, there was no significant mode difference in the actual survey participation rates among those who had indicated agreement to participate, $\chi(1)=.76$, $p=.38$. That is, out of individuals who answered ‘yes’ to our invitation, the percent who actually started the survey was similar in the web and the face-to-face mode (89.7% vs. 91.0%). Moreover, the individuals who ended up participating in the two modes showed no significant differences in terms of their education, or the other demographic measures for income, gender and age ($p>.10$).

The first logistic regression model in Table 2 (column 1) confirms that participation rates did not differ significantly between the web and face-to-face modes, even after taking into account demographic variables.⁶ Age was the only demographic variable that showed a significant independent relationship with participation rates. Indeed, the 95% confidence interval shows that the odds ratio for age was significantly greater than 1, indicating that older adults were more likely to participate. However, it should be noted that the age difference between participants and non-participants was only approximately one year (Table 1).

The next two logistic regression models in Table 2 show the independent contributions of the different demographic variables to participation in the separate modes. Age was the only significant

predictor, with older adults being more likely to participate in either mode. Moreover, a comparison of the odds ratios shows that the relationship between age and participation was significantly different in the two modes.⁷ That is, a comparison of the 95% intervals associated with the odds ratios for age in the models for the web mode and the face-to-face mode suggests that they are barely overlapping. As noted, web mode participants were on average one year older than face-to-face mode participants (Table 1).

3. RESULTS

3.1. Effects of mode and wording on item non-responses for the expectation question.

The first row of Table 3 shows the percent of participating individuals who provided no response to the expectation question, by mode and wording. The ‘prices in general’ question showed no significant mode effect, with item non-responses being similar in the web mode and in the face-to-face mode. By contrast, the ‘inflation’ question was more likely to be skipped in front of an interviewer in the face-to-face mode than in front of a computer in the web mode.

Another way to conduct these analyses is to examine question wording effects on response rates within each mode. Non-responses among web survey respondents were similarly likely with either question, $\chi(1)=1.11, p=.29$. By contrast, the face-to-face mode showed a significant effect of question wording on non-responses, such that participants were more likely to skip the question about ‘inflation’ than the question about ‘prices in general’ in front of an interviewer, $\chi(1)=19.25, p<.01$.

The first column of Table 4 shows significant effects of administration mode and question wording on item non-responses, in a logistic regression that took into account demographic variables. That is, participants were significantly more likely to skip the expectations question in the face-to-face mode and with the ‘inflation’ wording. There were no significant relationships of item non-responses with demographic variables, including whether or not participants had a college education ($p>.10$). Due to the low number of non-responses in three of the four wording x mode experimental conditions (e.g., .3% for ‘prices in general’ question in web mode, .0% for ‘prices in general’ question in face-to-face mode, and .0% for the ‘inflation’ question in the web mode), the logistic regression was were

unable to assess interactions between wording and mode. However, the reported chi-square tests suggested greater similarity across question wordings administered on the web than in the face-to-face mode (see Table 3).

3.2. Wording and mode effects on revisions made.

The second row of Table 3 shows the percent of participants who made a revision when given the opportunity, among those who provided an initial response. For both the ‘prices in general’ and the ‘inflation’ questions, there were significantly more revisions in the web survey than in the face-to-face mode.

Another way to conduct these analyses is to examine question wording effects on revisions within each mode. In the web survey, there was a significant effect of question wording on revisions, with the question about ‘inflation’ yielding significantly more revisions than the question about ‘prices in general,’ $\chi(1)=10.83, p<.01$. By contrast, the face-to-face mode showed no significant effect of question wording on revisions, $\chi(1)=2.34, p=.13$.

Columns 2-3 of Table 4 show a significant effect of administration mode and question wording on revisions, in a logistic regression that took into account demographic differences. Revisions were significantly more likely in the web mode and with the ‘inflation’ wording. There was also a significant relationship between having no college education and revising answers. That is, participants without a college education were significantly more likely than those with a college education to make revisions (4.7% vs. 1.7%, $\chi(1)=8.55, p<.01$). Because the Michigan Survey of Consumers asks only participants who give initial expectations of over 5% to consider a revision, we examined whether revisions were more likely among participants who gave initial responses over 5% (see section 3.5 for further analyses of this measure). We did indeed find that those who gave initial expectations over 5% were more likely to revise their responses than participants who gave lower initial expectations (19.4% vs. 2.7%, $\chi(1)=48.41, p<.01$).

Due to the low number of observed revisions in some of the experimental conditions (e.g., 0% revisions being observed for the ‘prices in general’ question in the face-to-face mode and .6% for the

‘inflation’ question in the face-to-face mode), interactions of question wording and mode could not be tested in the logistic regressions. Yet, chi-square tests suggests that the reported question wording effects are larger in the web mode than in the face-to-face model, with a relatively high percent of revisions for the ‘inflation’ question in the web survey mode (Table 3).

3.3. Effects of wording, mode, and revision opportunity on the central tendency of reported expectations.

Table 5 shows the means and medians of participants’ expectations, as reported before and after they were given the opportunity to revise, by question wording and survey mode.⁸ Because associated distributions were not normal (Figures 1-2), we used the between-subjects Mann–Whitney (M–W) test and the paired-sample Wilcoxon (W) test, each of which provides a non-parametric alternative to the equivalent *t*-test (Siegel & Castellan, 1988). For initial expectations, as reported before the opportunity to revise, significant mode effects emerged for both question wordings. That is, initial expectations were significantly higher in the web mode than in the face-to-face mode for questions asking about ‘prices in general’ (M-W $z=-2.54$, $p=.01$) and ‘inflation’ (M-W $z=-3.83$, $p<.01$). Final expectations were also significantly higher in the web surveys than in the face-to-face mode for questions asking about ‘prices in general’ (M-W $z=-2.40$, $p=.02$) and ‘inflation’ (M-W $z=-3.16$, $p<.01$).

We also examined wording effects within each mode. For initial expectations, as reported before the opportunity to revise, significant question wording effects emerged in the face-to-face mode (M-W $z=-3.27$, $p<.01$). That is, initial expectations for ‘prices in general’ were higher than initial expectations for the ‘inflation’ which follows the question wording effect reported in previous research (Bruine de Bruin *et al.*, 2012). Although this pattern was also seen in the medians of the web mode, the means in the web mode showed a marginal difference in the opposite direction (M-W $z=-1.86$, $p=.06$), perhaps due to the especially large dispersion for the ‘inflation’ question in the web mode, seen in standard deviations and mean absolute deviation from the median (Table 5). After the opportunity to revise, however, final expectations for ‘prices in general’ were significantly higher than

final expectations for ‘inflation,’ in both modes (M-W $z=-3.20$, $p<.01$ for the face-to-face mode; M-W $z=-2.34$, $p=.02$ for the web mode), while also showing more similar measures of dispersion (Table 5).

Additionally, we examined the effect of being given the opportunity to revise reported expectations. The revision prompt reduced reported expectations among web respondents (W $z=-2.05$, $p=.04$ for ‘prices in general’; W $z=-2.80$, $p<.01$ for ‘inflation.’) Being presented with the opportunity to revise made no significant difference for either question wording in the face-to-face mode ($p>.10$ for each).

Table 6 shows that these administration mode and wording effects held in linear regressions on initial expectations and on final expectations, when taking into account demographic differences. Participants without (vs. with) a college education gave higher expectations, reaching significance before the revision prompt. A marginally significant gender difference appeared only for initial expectations, with women giving higher expectations than men. There were no other significant demographic differences ($p>.10$). However, there was a marginally significant interaction between mode and wording before the revision prompt ($B=-1.08$, $t=-1.92$, $p=.06$). As seen in Table 5, mode differences in initially reported expectations were larger for the ‘inflation’ than for the ‘prices in general’ question, such that reported expectations were especially high in the web-version of the inflation question before the revision prompt. This interaction was not retained after the revision prompt ($B=-.27$, $t=-.76$, $p=.45$). There were no other significant two-way or three-way interactions between wording, mode, and whether or not participants had completed a college education ($p>.10$; not shown). Appendix 3 shows the means and medians for initial and final expectations reported in different demographic groups, by mode and wording.⁹

3.4. Effects of wording, mode and revision opportunity on the dispersion of reported expectations.

Table 5 shows two measures of dispersion, including standard deviations of reported expectations and the mean absolute deviation from the median. We focus on the latter, because the mean absolute deviation from the median is less likely than the standard deviations to be affected by

the skewness of the distribution (Fligner & Killeen, 1976). Mann-Whitney tests on absolute deviations from the median showed significant mode effects on the dispersion observed in responses for each question wording, both before and after the revision prompt. For initial expectations, as reported before the opportunity to revise, significant mode effects emerged for both question wordings. That is, initial expectations showed significantly more dispersion in the web mode than in the face-to-face mode for questions asking about ‘prices in general’ (M-W $z=-3.34$, $p<.01$) and ‘inflation’ (M-W $z=-2.72$, $p<.01$). Final expectations were also significantly more dispersed in the web surveys than in the face-to-face mode for questions asking about ‘prices in general’ (M-W $z=-2.94$, $p=.02$) and ‘inflation’ (M-W $z=-2.10$, $p<.01$).

It is also possible to examine wording effects within mode, as seen in the dispersion observed before and after the revision prompt. The Mann-Whitney’s test on the absolute deviation from the median did find significant wording effects on dispersion within each mode, in expectations reported initially as well as after the revision prompt. In the face-to-face mode, reported expectations showed significantly more dispersion for ‘prices in general’ than for ‘inflation’ (M-W $z=-2.82$, $p<.01$ for initial; M-W $z=-2.75$, $p<.01$ for final). In the web mode, final expectations also showed this pattern, with more dispersion for ‘prices in general’ than for ‘inflation’ (M-W $z=-2.44$, $p<.05$). However, the opposite pattern was seen in initial expectations as reported in the web mode, with dispersion being higher for ‘inflation’ than for ‘prices in general’ (M-W $z=-2.29$, $p<.05$).

The revision prompt reduced the dispersion of expectations in the web mode, as seen in a significant effect for the ‘inflation’ question (W $z=-2.85$, $p<.01$) and the ‘prices in general’ question (W $z=-1.96$, $p<.05$). The opportunity to revise had no significant effect on the dispersion observed in the face-to-face mode for either question ($p>.10$).

Table 6 shows a significant mode effect on the absolute deviation from the median, with web mode showing higher dispersion, in linear regressions that took into account wording effects and demographic differences. This finding was observed in initial expectations as reported before the revision prompt, and in final revisions as reported after the revision prompt. Unlike previous studies (e.g., Bruine de Bruin *et al.*, 2012), we found no significant effect of question wording on the

dispersion of either the initial or final expectations. Deviations from the median were significantly larger among participants without (vs. with) a college education, both in initial and final expectations. Another significant demographic difference pertained to gender, such that women's initial and final expectations were significantly more dispersed than men's. For low-income participants, a marginally significant difference only emerged after the revision prompt, showing higher dispersion than high-income participants. There were no other significant demographic differences ($p > .10$). There were no significant two-way or three-way interactions between wording, mode, and whether or not participants had completed a college education ($p > .10$; not shown). Appendix 3 shows the dispersion of initial and final expectations, as reported in different demographic groups, by mode and wording.¹⁰

3.5. Effects of wording, mode and revision opportunity on the percent of expectations over 5%.

Table 5 shows the percent of participants who reported expectations that were higher than '5%'. Following previous work (Bruine de Bruin *et al.*, 2010, 2011b, 2012), we used this cut-off, because the Michigan Survey of Consumers treats participants who provide expectations above 5% and provides them with the opportunity to revise (Curtin, 1996). As compared to previous studies that were conducted at times of higher realized inflation (Bruine de Bruin *et al.* 2010, 2012), the percent of reported expectations over 5% were relatively low.

When examining initial expectations reported before the revision prompt, significant mode effects emerged for each question wording. That is, we found significantly more responses over 5% in the web mode than in the face-to-face mode, for the 'prices in general' question, $\chi(1)=8.85, p < .01$, as well as for the 'inflation' question, $\chi(1)=6.68, p = .01$. A similar pattern was seen in expectations reported after the revision prompt, reaching significance for the 'prices in general' question, $\chi(1)=7.18, p = .01$, and marginal significance for the 'inflation' question, $\chi(1)=2.81, p = .09$.

It is also possible to instead examine wording effects on the percent of expectations over 5% reported within each mode. Chi-square tests on initial expectations found no significant differences between question wordings within each mode ($p > .10$). When examining expectations reported after the revision prompt, a marginally significant question wording effect emerged in the web survey, with

more responses over 5% being seen for the ‘prices in general’ question, $\chi(1)=2.82, p=.09$. There was no significant question wording effect on the percent of expectations higher than 5% in the face-to-face mode ($p>.10$).

Being presented with the opportunity to revise significantly reduced the percent of expectations over 5% for the web administration of the ‘inflation’ question ($W z=-2.12, p=.03$). It made no significant difference for the face-to-face version of the ‘inflation’ question, or either version of the ‘prices in general’ question ($p>.10$).

Table 6 shows a significant administration mode effect on the likelihood of reporting expectations over 5%, in logistic regressions that took into account wording effects and demographic differences. Reporting expectations over 5% was more likely in the web mode than in the face-to-face mode, both before and after the revision prompt. There was no significant wording effect on reporting initial expectations over 5%, but final expectations showed a marginally significant difference, with the ‘prices in general’ wording producing more final expectations over 5% than in the ‘inflation’ wording. Additionally, participants without a college education were more likely to report initial and final expectations over 5%. This was also observed for participants who were in the low-income group, women, and younger. There were no significant two-way or three-way interactions between wording, mode, and whether or not participants had completed a college education ($p>.10$; not shown).¹¹ Because confidence intervals for initial and final expectations overlapped for each variable, it can be concluded that the revision prompt did not significantly change the observed relationships with reporting expectations over 5%. Appendix 3 shows the percent of participants reporting expectations over 5%, for initial and final expectations reported in different demographic groups, by mode and wording.

4. DISCUSSION

A growing number of national household surveys in different countries have been following consumers’ inflation expectations. Median responses tend to be in line with realized inflation estimates (Ang, Beikaert, & Wei, 2007; Hafer & Hein, 1985; Thomas, 1999; Christensen, Van Els, &

Van Rooij, 2006). However, responses have also revealed relatively large disagreement between respondents and positively skewed distributions, with some individuals giving responses over 5% (Bates & Gabor, 1986; Bruine de Bruin *et al.*, 2010; Bryan & Venkatu, 2001). Findings have also tended to differ between surveys, perhaps because of differences in their survey design features.

Here, we present the findings of what we believe to be the first study that systematically tested for effects of the administration mode (web vs. face-to-face) on reported expectations. We also examined the effect of additional survey design features that vary across consumer surveys about inflation expectations: Question wording ('prices in general' vs. 'inflation') and the opportunity to revise responses. To avoid the need to adjust for sample differences, we followed Fricker *et al.*'s (2005) recommendation to recruit all participants from the same sample. Specifically, we selected members of a Dutch internet panel who consented to receiving our questions in either mode, and who ended up being equally likely to participate in either mode. They were randomly assigned to mode and question wording. To avoid the criticism that mode effects often occur due to different question designs being used in different modes (Dillman & Christian, 2005), we used the same question designs in each mode. We report on four main findings.

Our first main finding is that item non-response rates were low in both modes for both question wordings, but slightly higher for the 'inflation' question in the face-to-face mode. Previous research found that item non-response rates were similar for both question wordings, on a web survey conducted with RAND's American Life Panel, where participants were used to receiving regular questions about inflation and were discouraged from skipping questions by automatic prompts to please provide an answer (Bruine de Bruin *et al.* 2012). Yet, that study did find that participants found the 'inflation' wording more difficult than the 'prices in general' wording (Bruine de Bruin *et al.*, 2012). It is possible that participants in our survey were slightly less willing to answer the difficult 'inflation' question in front of an interviewer, due to concerns about giving the wrong answer. Yet, missing responses were not more likely among participants who had no college education, who tend to feel more uncertainty about what inflation expectations to report (Bruine de Bruin *et al.*, 2011a). It is also possible that interviewers were more permissive about non-responses for the 'inflation'

question, due to perceiving the ‘inflation’ question as more difficult. Indeed, even trained interviewers can inadvertently influence participants’ motivation to provide an answer (Conrad & Schober, 2000), and make mistakes when deviating from standard protocols (Groves & Magilavy, 1986). Nevertheless, any wording and mode effects on reported expectations may have been partially influenced by differential responding to the ‘inflation’ question in the face-to-face mode.

Second, we found systematic mode effects on reported expectations and their dispersion. Specifically, the face-to-face mode resulted in somewhat lower reported mean and median expectations and less dispersion as compared to the web mode (Table 5). There were no significant mode differences in participation rates or the percent of participants with a college education (Table 1) that could have explained this result. However, participants were significantly more likely to skip the ‘inflation’ question in the face-to-face mode, as compared to other combinations of wording and mode. Non-responses likely reflect uncertainty about what to answer. Uncertain participants who do answer the question tend to report higher and more dispersed expectations (Bruine de Bruin et al., 2011a). As a result, survey design conditions that encourage non-responses may not represent the full range of participants’ expectations, leading to artificially lower and less dispersed responses.

Additionally, the mode difference in the central tendency and dispersion of expectations may also reflect the finding from the survey design literature that the presence of an interviewer, as in the face-to-face mode, may increase socially desirable responses. If participants were aware of realized inflation and the inflation expectations of most others, the presence of an interviewer may have reduced their use of extreme responses. However, the reported mode effects were no more pronounced in participants with (vs. without) a college education, who may have been more likely to know the CPI. It is also possible that interviewers gave implicit or explicit cues about the appropriateness of reporting high inflation expectations.

Third, we found that revisions were most likely to be made for the ‘inflation’ question in the web survey, resulting in lower reported expectations after the revision prompt. Possibly, this reflects the ‘inflation’ question being perceived as more difficult (Bruine de Bruin *et al.*, 2012), and being answered with more uncertainty. Participants may have also been less willing to make revisions in

front of an interviewer as a result of what psychologists refer to as ‘defensive bolstering’ (Lerner & Keltner, 1999). Indeed, people express stronger beliefs when they feel that another person might be judging them (Lerner & Keltner, 1999). Across modes, revisions were most likely to be made by participants without a college education and who gave initial expectations over 5%, who also tend to feel the most uncertain about which inflation expectations to report (Bruine de Bruin *et al.*, 2011a).¹² Yet, revisions were also made by participants with a college education and those giving responses below 5%. From a survey design perspective, if the opportunity to revise is provided, it is therefore important to (a) give *all* participants the opportunity to revise rather than just a sub-set, so that all responses are comparable in the sense of being generated through the same survey design; (b) report on expectations reported before and after the opportunity to revise, so as to understand the effect of this survey design feature on responses.

Fourth, we found question wording effects on reported expectations, especially after the revision prompt. Participants’ final answers had higher median and mean responses, as well as greater dispersion in expectations for “prices in general” than in expectations for “inflation”. Previous web studies had also found that the ‘prices in general’ wording lead to more disagreement about how to interpret the question, with some participants focusing on personal experiences with extreme price increases, while others thinking of the ‘inflation rate’ (Bruine de Bruin *et al.*, 2012). Our findings indicate that this effect of question wording is similar in web and face-to-face modes, suggesting that the presence of the interviewer did not help promote a more consistent interpretation of the two question wordings.

Like any study, ours had limitations. As noted, our study was conducted with a Dutch internet panel. Internet panels tend to have relatively high response rates, due to members having a relationship with the research organization. Response rates would likely have been lower, and varied more between modes, if participants had been recruited through other means. Second, our study was conducted at a time of historically low inflation. Effects of question wording and administration mode may be more pronounced when the actual inflation rate is higher, and when the variability in

price changes is higher. Thus, future research should examine how the reported effects of survey design features vary over time.

Overall, our findings suggest that mode and wording differences may influence responses to economic survey questions about inflation. The ‘inflation’ wording, as asked in the face-to-face mode, produced the lowest and least dispersed expectations. However, we are unable to conclude that these responses were also more valid. To test for validity, it is crucial to examine whether reported expectations correspond with actual behavior (Armantier *et al.*, 2015). One possibility is that web-based and interviewer-assessed expectations are both relevant, but for different types of behaviors. Expectations expressed in front of an interviewer may possibly be more indicative of expectations that are used in decisions made in the presence of others. Expectations expressed on a web survey may possibly be more indicative of expectations that are used in decisions that are made alone. Similarly, it has previously been argued that questions about ‘inflation’ may be more relevant to long-term macro-economic expectations, and questions about ‘prices in general’ to consumers’ purchasing decisions (Bruine de Bruin *et al.*, 2012). If so, both administration modes and question wordings may be of relevance to economists. Which specific survey design features are implemented, should therefore depend on the research and policy goals the findings are meant to inform.

Our paper suggests that systematic differences in administration mode, question wording, and opportunities to revise could significantly affect the comparability of survey findings. In public opinion research, it has also been noted that variations in survey design systematically affect participants’ responses (e.g., Dillman *et al.* 2009). Thus, systematic studies like the one presented here are needed to understand the effect of survey design features on responses to existing consumer surveys. To permit more informative comparisons across related surveys, it is of course important that details about mode, wording, the opportunity to revise, and other survey design features are made publicly available.

Our findings are also relevant for institutions considering a change in survey design. Some organizations may be considering a switch from in-person interviews to web-based interviews, in light of cost-effectiveness goals. The choice of mode should also be motivated by potential effects on

participation rates, item non-responses, as well as responses themselves (Couper 2011, Dillman *et al.* 2009).

5. FOOTNOTES

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- ¹ This finding goes against many people's intuitions that test scores would be hurt by switching answers (Kruger *et al.* 2005; Liu *et al.* 2015).
- ² We included no telephone interviews, because face-to-face interviews and telephone interviews show few differences (Shuy 2002). The few studies that have found differences between these interviewer-administered modes suggest that face-to-face interviews yield data of better quality (Aquilino, 1994; Holbrook *et al.*, 2003).
- ³ Taylor Nelson Sofres - Nederlands Instituut voor Publieke Opinie. TNS-NIPO is a reputable survey company that is well-known in the Netherlands.
- ⁴ The regular compensation for completing an online interview in the LISS panel is 5 euro.
- ⁵ As noted earlier, in the Michigan Survey instead only respondents whose initial response exceeded 5% in absolute value were offered the opportunity to revise.
- ⁶ The income variable has 38 missing observations among the 1539 participants.
- ⁷ Adding a mode x age interaction term to the model for the full sample in Table 2 also indicates a relatively small significant effect (Odds Ratio=.97, 95% Confidence Interval=.95, 1.00, $p=.01$).
- ⁸ Statistical weights were not applied to analyses that examined effects of these survey design features on means and medians. Our analyses did not use statistical weights to correct for the small deviations in demographic composition between the overall contacted sample ($n=4310$) and the sample of individuals who participated *and* responded to the expectations question in each of the four conditions (web vs. face-to-face mode x 'prices

in general' vs. 'inflation' wording). When applying such weights, we found no effect on the reported medians, and only small effects on reported means and standard deviations (results available from the authors upon request). Hence, the overall pattern of results and conclusions were unaffected by non-participation and item non-response rates.

- ⁹ We conducted regression analyses on initial and final expectations, in which we entered two-way interaction effects of all demographic variables with administration mode and with question wording. We found a marginally significant interaction effect between administration mode and income for initial expectations reported before the revision prompt ($B=1.18, p=.07$), which reaches significance for revised expectations reported after the prompt ($B=1.21, p<.01$). These interactions suggest that low-income participants were more likely to give expectations over 5% in the web mode than in the face-to-face mode.
- ¹⁰ When entering two-way interaction effects of all demographic variables with administration mode and with question wording in regressions predicting dispersion in initial and final expectations, one significant interaction emerged. Low-income participants produced significantly more dispersion in final expectations reported in the web mode than in the face-to-face mode ($B=.82, p=.03$).
- ¹¹ When considering two-way interactions of demographic variables with administration mode and question wording, we find the following significant interactions. In both initial and final expectations, there was a significant interaction between question wording and gender ($OR=.16, 95\% CI=.03-.74, p<.05$ for initial; $OR=.15, 95\% CI=.03-.85, p<.05$ for final) and a marginally significant interaction between mode and age ($OR=1.04, 95\% CI=1.00, 1.08, p=.08$; for final only)
- ¹² In our previous web surveys with RAND's American Life Panel, we found little to no use of the revision prompt. It is possible that those participants were more certain about their

inflation expectations, due to being asked financial and inflation questions more regularly. It is also possible that those participants have learned to ignore reminder prompts, because they get them every time they try to skip a question.

6. REFERENCES

- Ang A, Bekaert G, Wei M. 2007. Do Macro variables, asset markets or surveys forecast inflation better? *Journal of Monetary Economics* **54**: 1163–1212.
- Armantier O, Bruine de Bruin W, Topa G, van der Klaauw W, Zafar B. 2015. Inflation expectations and behavior: Do survey respondents act on their beliefs? *International Economic Review* **56**: 505-536
- Armantier O, Bruine de Bruin W, Potter S, Topa G, van der Klaauw W, Zafar B. 2013a. Measuring inflation expectations. *Annual Review of Economics* **5**: 273-301.
- Armantier O, Topa G, van der Klaauw W, Zafar B. 2013b. Introducing the FRBNY Survey of Consumer Expectations: Survey goals, design and content.
<http://libertystreeteconomics.newyorkfed.org/2013/12/introducing-the-frbny-survey-of-consumer-expectations-survey-goals-design-and-content.html#.Vgo-sKSFOP8>. Accessed 29 september 2015.
- Armantier O, Topa G, van der Klaauw W, Zafar B. 2013c. Introducing the FRBNY Survey of Consumer Expectations: Measuring Price Inflation Expectations.
<http://libertystreeteconomics.newyorkfed.org/2013/12/introducing-the-frbny-survey-of-consumer-expectations-measuring-price-inflation-expectations.html#.VgpAbqSFOP8>
Accessed 29 september 2015.
- Aquilino WS. 1994. Interview mode effects in surveys of drug and alcohol use: A field experiment. *Public Opinion Quarterly* **58**: 210-240.
- Bassili JN, Scott BS. 1996. Response latency as a signal to question problems in survey research. *Public Opinion Quarterly* **60**: 390-399.

- Bates JM, Gabor A. 1986. Price perception in creeping inflation: Report on an enquiry. *Journal of Economic Psychology* **7**: 269–290.
- de Best-Waldhober M, Daamen D, Faaij A. 2009. Informed and uninformed public opinions on CO₂ capture and storage technologies in the Netherlands. *International Journal of Greenhouse Gas Control* **3**: 322-332.
- Bishop GF, Oldendick RW, Tuchfarber AJ, Bennett SE. 1989. Pseudo-opinions on public affairs. *Public Opinion Quarterly* **44**: 198-209.
- Bishop GF, Tuchfarber AJ, Oldendick RW. 1986. Opinions on fictitious issues: The pressure to answer survey questions. *Public Opinion Quarterly* **50**: 240-250.
- Bruine de Bruin W. 2011. Framing effects in survey design: How respondents make sense of the questions we ask. [Book chapter]. In: Keren, G. Ed. *Perspectives on Framing*. London, UK: Taylor Francis pp. 303-324.
- Bruine de Bruin W, van der Klaauw W, Topa G, Downs JS, Fischhoff B, Armantier O. 2012. The effect of question wording on consumers' reported inflation expectations. *Journal of Economic Psychology* **4**: 749-757.
- Bruine de Bruin W, Manski CF, Topa G, VanderKlaauw W. 2011a. Measuring consumer uncertainty about future inflation. *Journal of Applied Econometrics* **26**: 454-478.
- Bruine de Bruin W, van der Klaauw W, Topa G. 2011b. Inflation expectations: The biasing effect of thoughts about specific prices. *Journal of Economic Psychology* **32**: 834-845.
- Bruine de Bruin W, van der Klaauw W, Downs JS, Fischhoff B, Topa G, Armantier O. 2010. Expectations of inflation: The role of financial literacy and demographic variables. *Journal of Consumer Affairs* **44**: 381-402.
- Bryan MF, Venkatu G. 2001. The demographics of inflation opinion surveys. *Federal Reserve Bank of Cleveland Economic Commentary* **10**: 1–4.
- Chang L, Krosnick JA. 2009. National surveys via RDD telephone interviewing versus the internet comparing sample representativeness and response quality. *Public Opinion Quarterly* **73**: 641-678.

- Christensen CA, van Els PJA, van Rooij MCJ. 2006. Dutch households' perceptions of economic growth and inflation. *De Economist* **154**: 277-294.
- Conrad FG, Schober MF. 2000. Clarifying question meaning in a household telephone survey. *Public Opinion Quarterly* **64**: 1-28.
- Couper M. 2011. The future of modes of data collection. *Public Opinion Quarterly* **75**: 889-908.
- Cunningham R, Desroches B, Santor E. 2010. Inflation expectations and the conduct of monetary policy: A review of recent evidence and experience. *Bank of Canada Review* **Spring**: 13-25.
- Curtin RT. 1996. Procedure to Estimate Price Expectations. Ann Arbor, MI: University of Michigan Survey Research Center.
- Curtin R, Presser S, Singer E. 2005. Changes in telephone survey nonresponse over the past quarter century. *Public Opinion Quarterly* **69**: 87-98.
- Dillman DA, Christian LM. 2005. Survey mode as a source of instability in responses across surveys. *Field Methods* **17**: 30-52.
- Dillman DA, Smyth JD, Christian LM. 2009. *Internet, mail, and mixed-mode surveys: The tailored design method*. Third Edition. Hoboken, NJ: Wiley.
- European Union 2015a. Digital Agenda for Europe: Broadband strategy and policy. <https://ec.europa.eu/digital-agenda/en/broadband-strategy-policy> Accessed 28 August 2015.
- European Union 2015b. Digital Agenda for Europe: Netherlands. <https://ec.europa.eu/digital-agenda/en/scoreboard/netherlands> Accessed 28 August 2015.
- Gali J. 2008. *Monetary policy, inflation, and the business cycle: An introduction to the new Keynesian framework*. Princeton NJ: Princeton University Press.
- Fligner MA, Killeen TJ. 1976. Distribution-free two-sample tests for scale. *Journal of the American Statistical Association* **71**: 210–213.
- Fricker S, Galesic M, Tourangeau R, Yan T. 2005. An experimental comparison of Web and telephone surveys. *Public Opinion Quarterly* **69**: 370–392.
- Glaser M, Langer T, Reynders J, Weber M. (2007). Framing effects in stock market expectations. *Review of Finance* **11**: 325-357.

- Groves RM, Magilavy LJ. 1986. Measuring and explaining interviewer effects in centralized telephone surveys. *Public Opinion Quarterly* **50**: 251-260.
- Hafer RW, Hein SE. 1985. On the accuracy of time-series, interest rate, and survey forecasts of inflation. *The Journal of Business*, **58**: 377–398.
- Heerwegh D, Loosveld G. 2008. Face-to-face versus web surveying in a high internet-coverage population. *Public Opinion Quarterly* **72**: 836-846.
- Holbrook AL, Green MC, Krosnick JA. 2003. Telephone vs. face-to-face interviewing of national probability samples with long questionnaires: Comparisons of respondent satisficing and social desirability response bias. *Public Opinion Quarterly* **67**: 79-125.
- Holleman B. 1999. Wording effects in survey research using meta-analysis to explain the forbid/allow asymmetry. *Journal of Quantitative Linguistics* **6**: 29–40.
- Knäuper B, Belli RF, Hill DH, Herzog AR. 1997. Question difficulty and respondents' cognitive ability: The effect on data quality. *Public Opinion Quarterly* **13**:181-199.
- Kwak N, Radler B. 2002. A comparison between mail and web surveys: Response pattern, respondent profile, and data quality. *Journal of Official Statistics* **18**: 257-274.
- Kreuter F, Presser S, Toureangeau R. Social desirability bias in CATI, IVR, and web surveys: The effect of mode and question sensitivity. *Public Opinion Quarterly* **72**:847-865.
- Kruger J, Wirtz D, Miller DT. 2005. Counterfactual thinking and the first instinct fallacy. *Journal of Personality and Social Psychology* **88**: 725-735.
- Leiser D, Driori S. 2005. Naïve understanding of inflation. *The Journal of Socio-Economics*, **34**: 179–198.
- Lerner JS, Tetlock PE. 1999. Accounting for the effects of accountability. *Psychological Bulletin* **126**: 255-275.
- Link MW, Mokdad AH. 2005. Effects of survey mode on self-reports of adult alcohol consumption: a comparison of mail, Web and telephone approaches. *Journal of Studies on Alcohol* **66**: 239–245.
- Liu OL, Bridgeman B, Lixiong G, Xu J, Kong N. 2015. Investigation of response changes in the GRE revised general test. *Educational and Psychological Measurement* 1-19.

- Loftus EF, Palmer JC. 1974. Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior* **5**: 585–589.
- Ludvigson SC. (2004). Consumer confidence and consumer spending. *Journal of Economic Perspectives* **18**: 29-50.
- Parks KA, Pardi AM, Bradizza CM. 2006. Collecting data on alcohol use and alcohol-related victimization: a comparison of telephone and Web-based survey methods. *Journal of Studies on Alcohol* **67**: 318–323.
- Ranyard R, Del Missier F, Bonini N, Duxbury D, Summers B. 2008. Perceptions and expectations of price changes and inflation: A review and conceptual framework. *Journal of Economic Psychology* **29**: 378–400.
- Rasinski KA. 1989. The effect of question wording on public support for government spending. *Public Opinion Quarterly* **53**: 388-394.
- Sax LJ, Gilmartin SK, Bryant AN. 2003. Assessing response rates and nonresponse bias in web and paper surveys. *Research in Higher Education*, **44**: 409-432.
- Schonlau M, Asch BJ, Du C. 2003. Web survey as part of a mixed-mode strategy for populations that cannot be contacted by email. *Social Science Computer Review*, **21**: 218-222.
- Schonlau M, Van Soest A, Kapteyn A, Couper M. 2009. Selection bias in Web surveys and the use of propensity scores. *Sociological Methods and Research* **373**: 291-318.
- Shih TH, Fan X. 2008. Comparing response rates from web and mail surveys: A meta-analysis. *Field Methods*, **3**: 249-271.
- Shuy, R.W. (2002). In-person versus telephone interviewing. In: Gubrium J.G., & Holstein, J.A. *Handbook of Interview Research: Context and Method*. Sage Publications, Thousand Oaks, CA, pp 537–555.
- Siegel S, Castellan NJ. 1988. *Nonparametric statistics for the behavioral sciences 2nd ed.*. Boston, MA: McGraw-Hill.
- Statistics Netherlands 2014. Inflatie zakt naar 0.8%. <http://www.cbs.nl/nl-NL/menu/themas/prijzen/publicaties/artikelen/archief/2014/2014-022-pb.htm>. Accessed February 2, 2015.

- Statistics Netherlands 2014. Inflatie zakt naar 0,8 procent. <http://www.cbs.nl/nl-NL/menu/themas/prijzen/publicaties/artikelen/archief/2014/2014-022-pb.htm> Accessed 2 November 2014.
- Statistics Netherlands 2015. Consumer prices. Inflation since 1963. <http://statline.cbs.nl/Statweb/publication/?DM=SLLEN&PA=70936eng&D1=a&D2=12,25,38,51,64,77,90,103,116,129,142,155,168,181,194,207,220,233,246,259,272,285,298,311,324,337,350,363,376,389,402,415,428,441,454,467,480,493,506,519,532,545,558,571,584,597,610,623,636,649,662,671-684&LA=EN&STB=G1,T&CHARTTYPE=3&VW=T> Accessed November 2, 2015.
- Svenson O, Nilsson G. 1986. Mental economics: Subjective representations of factors related to expected inflation. *Journal of Economic Psychology* 7: 327–349.
- Taylor H. 2000. Does internet research work? *International Journal of Market Research* 42: 51-63.
- Thomas LB Jr. 1999. Survey measures of expected US inflation. *Journal of Economic Perspectives* 13: 125–144.
- Tourangeau R, Yan T. 2007. Sensitive questions in surveys. *Psychological Bulletin* 133: 859-883.
- Williamson MR, Wearing AJ. 1996. Lay people's cognitive models of the economy. *Journal of Economic Psychology* 17: 3–38.
- Yan T, Tourangeau R. 2008. Fast times and easy questions: The effects of age, experience and question complexity on web survey response times. *Applied Cognitive Psychology* 22: 51-68.

Table 1:
Demographic characteristics of signed-up and participating sample.

	Signed-up sample			Participating sample		
	Web mode (N=769)	Face to face mode (N=770)	Test of difference	Web mode (N=690)	Face to face mode (N=701)	Test of difference
Percent participated	89.7%	91.0%	$\chi(1)=.76$	-	-	-
Percent no college	59.4%	61.0%	$\chi(1)=.42$	60.4%	61.5%	$\chi(1)=.20$
Percent low income ^a	50.1%	49.8%	$\chi(1)=.02$	50.1%	49.1%	$\chi(1)=.14$
Percent female	46.0%	46.6%	$\chi(1)=.05$	45.9%	46.2%	$\chi(1)=.01$
Mean age (SD)	54.1 (16.9)	54.3 (16.2)	$t(1537)=-.18$	55.5 (16.1)	54.8 (16.8)	$t(1389)=.80$

Note: Tests of differences were not significant ($p>.10$)

^a Low income was defined as below the median of €1651 in income after taxes of per month.

Table 2: Logistic regression predicting participation (vs. not).

	Full sample (N=1501)	Web mode (N=750)	Face-to-face mode (N=751)
Web mode (vs. face to face)	1.14 (.80, 1.61)	-	-
No college	.78 (.53, 1.14)	.76 (.45, 1.30)	.78 (.45, 1.35)
Low income ^a	1.16 (.77, 1.73)	.96 (.54, 1.71)	1.39 (.79, 2.46)
Female	.97 (.67, 1.41)	.93 (.55, 1.57)	1.02 (.60, 1.74)
Age	1.04** (1.03, 1.05)	1.05** (1.04, 1.07)	1.02** (1.01, 1.04)
R^2	.07	.13	.03

Note: Presented numbers represent Odds Ratios (and associated 95% confidence intervals)

** $p < .01$; denote Odds Ratios significantly different from 1.00 at a 1% significance level.

^a Low income was defined as below the median of €1651 in income after taxes of per month.

Table 3: Percent of participants providing no response and making revision (vs. not).

	Prices in general			Inflation		
	Web (N=327)	Face to face (N=368)	Test of difference	Web (N=363)	Face to face (N=333)	Test of difference
Percent providing no response	.3%	.0%	$\chi(1)=1.13$	.0%	5.1%	$\chi(1)=19.00^{**}$
Percent making revision (if initial response provided)	3.4%	.0%	$\chi(1)=12.62^{**}$	9.6%	.6%	$\chi(1)=26.61^{**}$

^{**} $p<.01$

Table 4: Regression analyses on providing item non-response and making revision (vs. not).

	Item non- response (N=1354)	Revision (N=1337)	
Web mode (vs. face to face)	.05** (.01, .41)	23.46* (5.65, 97.44)	20.94** (5.02, 87.31)
Prices in general wording (vs. inflation)	.05** (.01, .40)	.30** (.15, .59)	.30** (.14, .57)
No college education	.51 (.17, 1.48)	3.19** (1.38, 7.35)	2.80* (1.20, 6.50)
Low income ^a	3.42 (1.03, 11.40)	1.01 (.49, 2.10)	.93 (.44, 1.97)
Female	1.03 (.36, 2.94)	1.71 (.87, 3.35)	1.46 (.73, 2.93)
Age	.98 (.95, 1.01)	1.00 (.98, 1.02)	1.00 (.98, 1.02)
Initial response over 5%	-	-	4.73** (2.07, 10.80)
<i>R</i> ²	.24	.22	.25

Note: Presented numbers represent odds ratios (and associated 95% confidence intervals). There was too little variation to compute interactions between mode and wording.

* $p < .05$. ** $p < .01$.

^a Low income was defined as below the median of €1651 in income after taxes of per month.

Table 5: Descriptive statistics for reported expectations by question wording and administration mode.

	Initial expectations (before revision prompt)				Final expectations (after revision prompt)			
	Median	Mean (SD)	Mean (SD) absolute deviation from median	Percent reporting expectation over 5%	Median	Mean (SD)	Mean (SD) absolute deviation from median	Percent reporting expectation over 5%
<i>Prices in general</i>								
Face-to-face mode	1.50	1.77 ⁱ (3.20)	1.37 ⁱ (2.90)	2.7%	1.50	1.77 ⁱ (3.20)	1.37 ⁱ (2.90)	2.7%
Web mode	2.00	2.41 ^{fa} (3.53)	1.89 ^{fa} (3.01)	7.7% ^f	2.00	2.31 ^{fi} (3.36)	1.80 ^{fi} (2.85)	7.1% ^f
<i>Inflation</i>								
Face-to-face mode	1.00	1.19 (2.78)	1.21 (2.51)	1.9%	1.00	1.20 (2.78)	1.21 (2.51)	1.9%
Web mode	1.50	2.82 ^{fa} (8.48)	2.47 ^{fpa} (8.22)	5.8% ^{fa}	1.50	1.92 ^f (3.70)	1.59 ^f (3.36)	4.1%

Note: M-W tests applied to between-group differences in means, and χ^2 tests to group differences in percentages, Wilcoxon tests to within-subject differences in means and percentages; Significance ($p < .05$) is noted for the following differences: ^f=significantly higher than for face-to-face mode; ⁱ=significantly higher than for inflation question; ^p=significantly higher than 'prices in general' question ^a=significantly higher than after prompt

Table 6: Regression analyses on expectations.

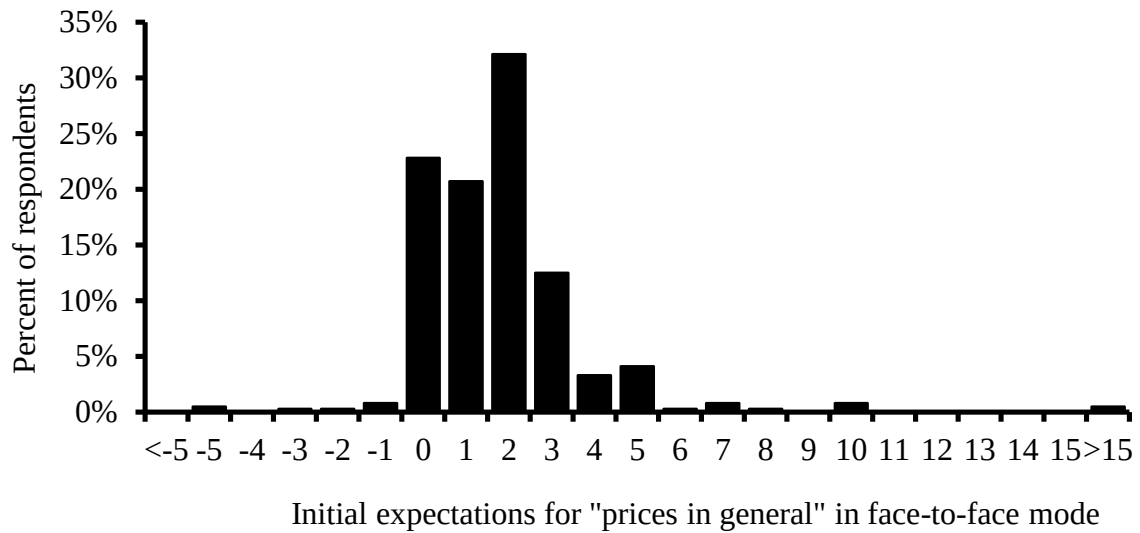
	Initial expectations (before revision prompt)			Final expectations (after revision prompt)		
	Expectations (<i>B</i>)	Absolute deviation from median (<i>B</i>)	Expectation over 5% (<i>OR</i>)	Expectations (<i>B</i>)	Absolute deviation from median (<i>B</i>)	Expectation over 5% (<i>OR</i>)
Web mode (vs. face to face)	1.16**	.90**	3.25** (1.77, 5.99)	.65***	.41**	2.68** (1.44, 4.99)
Prices in general wording (vs. inflation)	.03	-.28	1.39 (.81, 2.40)	.46**	.14	1.64+ (.91, 2.94)
No college education	.72*	.80**	3.01** (1.34, 6.72)	.34+	.41*	2.43* (1.08, 5.49)
Low income ^a	.21	.36	2.25* (1.07, 4.73)	.20	.34+	2.74* (1.22, 6.13)
Female	.58+	.77**	2.64** (1.37, 5.09)	.32	.51**	2.28* (1.15, 4.50)
Age	.00	-.01	.98* (.97, 1.00)	.00	-.01	.98* (.97, 1.00)
<i>R</i> ²	.02	.03	.16	.02	.14	.03

Note: For each model, *N*=1337. *B* is unstandardized estimate in linear regression predicting continuous variable; *OR*=Odds Ratio in logistic regression predicting dichotomous variable. +*p*<.10; **p*<.05; ***p*<.01; ****p*<.001. Significance denotes difference from 0 (*B*) or 1 (*OR*).

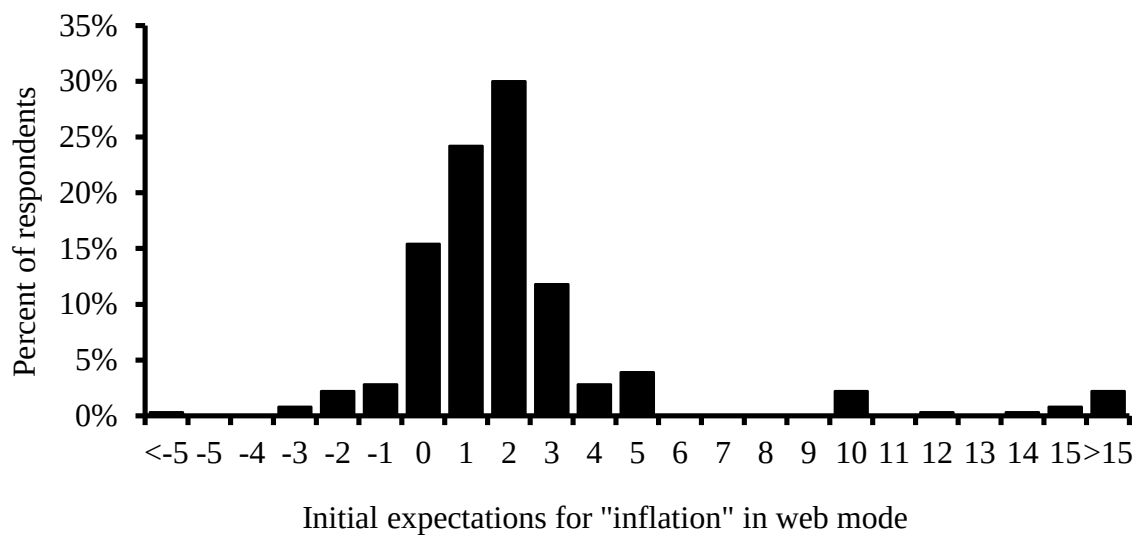
^a Low income was defined as below the median of €1651 in income after taxes of per month.

Figure 1: Initial expectations reported for (A) the ‘prices in general’ question in the web mode, (B) the ‘inflation’ question in the web mode, (C) the ‘prices in general’ question in the face-to-face mode, and (D) the ‘inflation’ question in the face-to-face mode

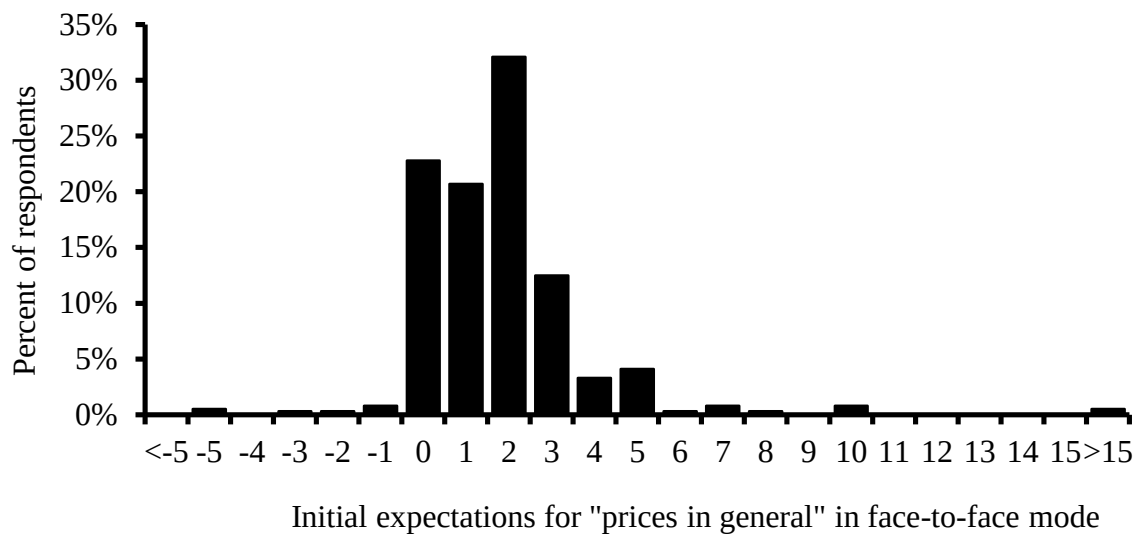
(A)



(B)



(C)



(D)

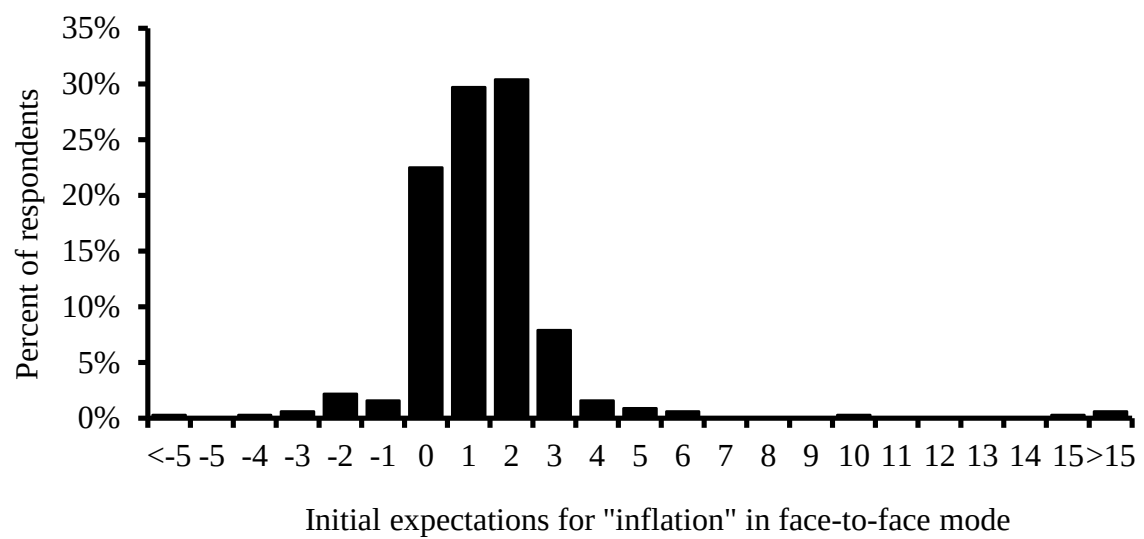
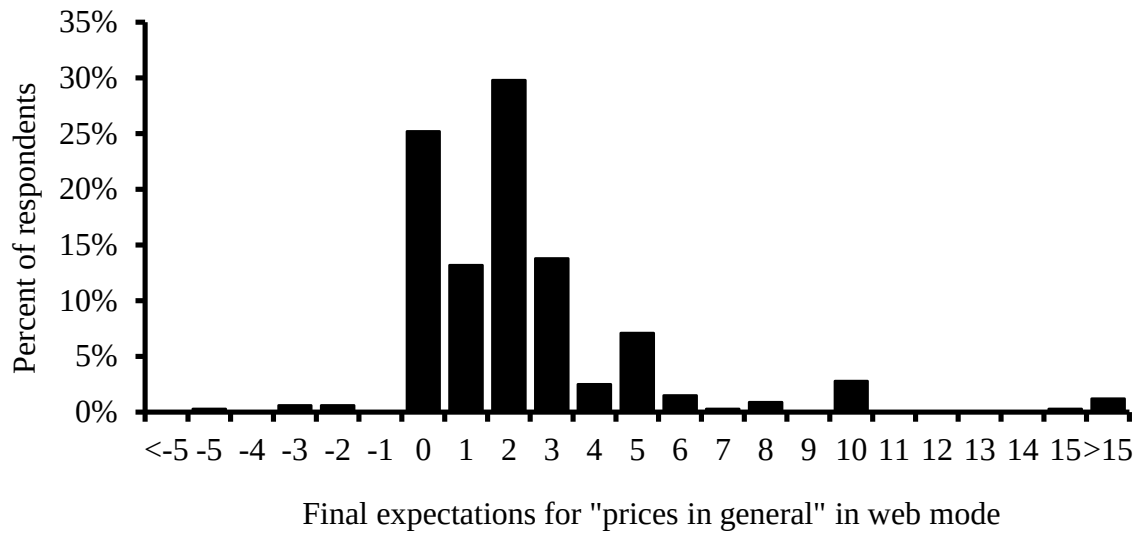
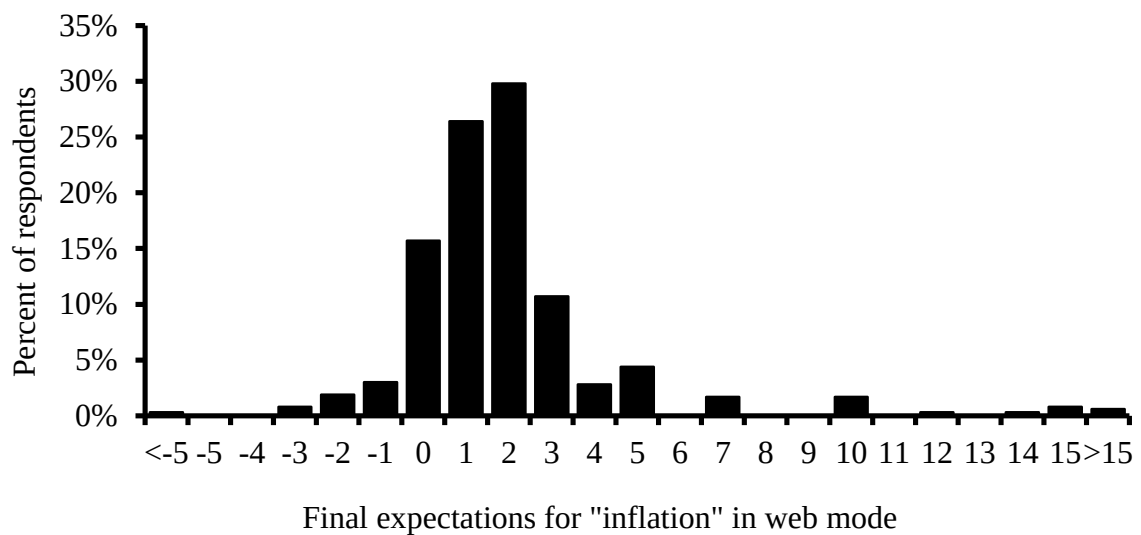


Figure 2: Final expectations reported for (A) the ‘prices in general’ question in the web mode, (B) the ‘inflation’ question in the web mode, (C) the ‘prices in general’ question in the face-to-face mode, and (D) the ‘inflation’ question in the face-to-face mode

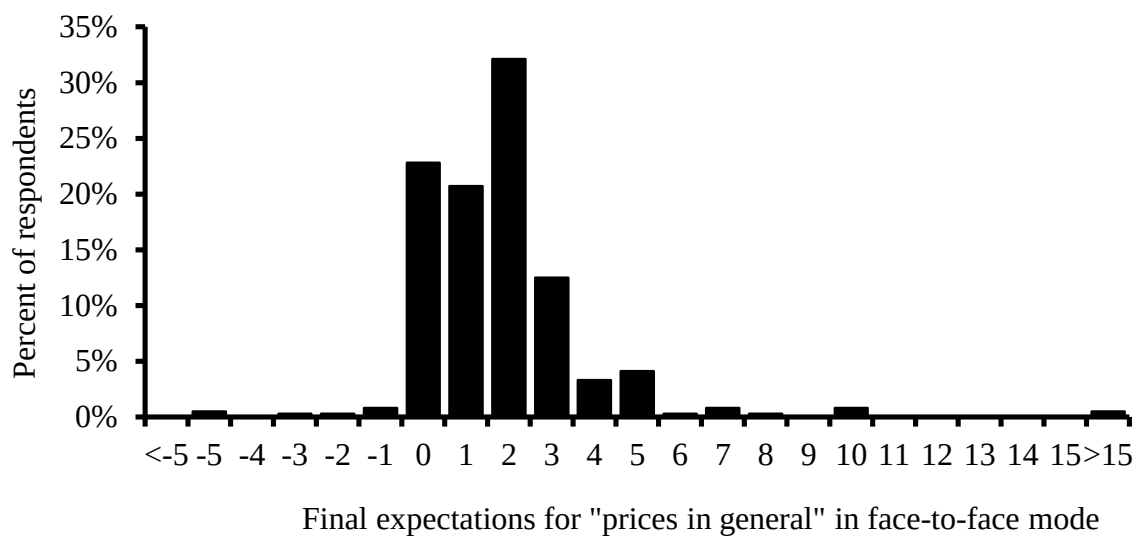
(A)



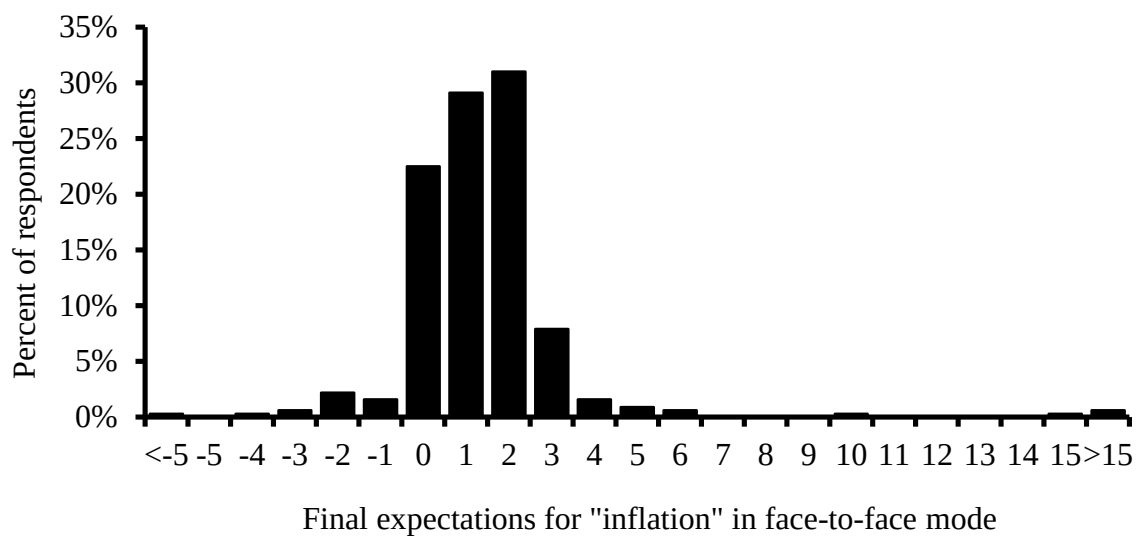
(B)



(C)



(D)



APPENDIX 1: Adapted Michigan survey protocol for ‘prices in general’ question wording.

- Q1a Do you think that, during the next 12 months, prices in general will go up, or go down, or stay where they are now?
- ☐ Go up
 - ☐ Go down
 - ☐ Stay the same

[If Q1a response is “Stay the same”]

- Q1b Do you mean that prices will go up at the same rate as now, or that prices in general will not go up during the next 12 months?
- ☐ Prices will go up at the same rate
 - ☐ Prices will not go up

[If Q1a response is “Go up” or Q1b response is “Prices will go up at same rate,” ask Q2-3 about prices going up. If Q1a response is “Go down” ask Q2-3 about prices going down]

- Q2 By what percent do you expect prices to go [up/down] on the average, during the next 12 months?
- percent

- Q3a I would like to make sure that I understood your answer. You said that you expect prices to go [up/down] during the next 12 months by [x] percent. Is that correct?
- ☐ Yes
 - ☐ No

[If Q3a response is “Yes”]

- Q3b By what percent do you expect prices to go [up/down] on the average, during the next 12 months?
- percent

[For every non-response to Q1-Q3]

You skipped the question [that asked about ...]. Don’t you know it or do you not want to answer it?

APPENDIX 2: Adapted Michigan survey protocol for ‘inflation’ question wording.

Q1a Do you think that, during the next 12 months, there will be inflation, deflation (the opposite of inflation) or neither?

☐ Inflation

☐ Deflation (the opposite of inflation)

☐ Neither

[If Q1a response is “Neither”]

Q1b Do you mean that the inflation rate will be the same rate as now, or that inflation during the next 12 months will be 0 (zero)?

☐ The inflation rate will be the same as now

☐ The inflation will be 0 (zero)

[If Q1a response is “Inflation” or Q1b response is “The inflation rate will be the same as now,” ask Q2-3 about inflation. If Q1a response is “deflation” ask Q2-3 about deflation]

Q2 What percent do you expect [inflation/deflation] to be during the next 12 months?

percent

Q3a I would like to make sure that I understood your answer. You said that you expect [inflation/deflation] to be [x] percent during the next 12 months. Is that correct?

☐ Yes

☐ No

[If Q3a response is “Yes”]

Q3b What percent do you expect [inflation/deflation] to be during the next 12 months?

percent

[For every non-response to Q1-Q3]

You skipped the question [that asked about ...]. Don’t you know it or do you not want to answer it?

Appendix 3: Demographic differences in initial and final expectations reported for each administration mode and question wording.

Demographic Group	Initial expectations (before revision prompt)					Final expectations (after revision prompt)			
	<i>N</i>	Median	Mean	Mean (<i>SD</i>) absolute deviation from median	Percent reporting expectation over 5%	Median	Mean	Mean (<i>SD</i>) absolute deviation from median	Percent reporting expectation over 5%
<i>'Prices in general' question wording in face-to-face mode</i>									
No college	229	1.50	1.90	1.54	3.5%	1.50	1.90	1.54	3.5%
College	139	1.50	1.55	1.08	1.4%	1.50	1.55	1.08	1.4%
Low income	179	1.50	1.75	1.44 ⁺	4.5% ⁺	1.50	1.75	1.44 ⁺	4.5% ⁺
High income	179	1.50	1.79	1.32	1.1%	1.50	1.79	1.32	1.1%
Old age	198	1.50	1.72	1.34	1.0%	1.50	1.72	1.34	1.0%
Young age	170	1.50	1.82	1.40	4.7% [*]	1.50	1.82	1.40	4.7% [*]
Female	183	1.50	1.97	1.70 ⁺	4.4% ⁺	1.50	1.97	1.70 ⁺	4.4% ⁺
Male	185	1.50	1.57	1.04	1.1%	1.50	1.57	1.04	1.1%
<i>'Inflation' question wording in face-to-face mode</i>									
No college	193	1.00	1.32	1.31 [*]	3.1% [*]	1.00	1.33	1.31 [*]	3.1% ⁺
College	123	1.20	.98	1.04	0.0%	1.20	.99	1.04	0.0%
Low income	145	1.00	1.02	1.39 ⁺	2.8%	1.00	1.02	1.39 ⁺	2.8%
High income	163	1.00	1.22	0.96	0.6%	1.00	1.24	0.96	0.6%
Old age	162	1.00	1.02	.99	0.6%	1.00	1.04	1.00	0.6%
Young age	154	1.20	1.37	1.43	3.3% ⁺	1.20	1.37	1.43	3.3% ⁺
Female	133	1.00	1.33	1.69 ^{**}	4.5% ^{**}	1.00	1.33	1.69 ^{**}	4.5% ^{**}
Male	183	1.00	1.09	0.85	0.0%	1.20	1.10	0.86	0.0%

Appendix 3 (contd.)

Demographic Group	Initial expectations (before revision prompt)					Final expectations (after revision prompt)			
	N	Median	Mean	Mean absolute deviation from median	Percent reporting expectation over 5%	Median	Mean	Mean absolute deviation from median	Percent reporting expectation over 5%
<i>'Prices in general' question wording in web survey mode</i>									
No college	198	2.00	2.67	2.25***	10.1%*	2.00	2.51	2.10**	9.1%+
College	128	2.00	2.00	1.33	3.9%	2.00	2.00	1.33	3.9%
Low income	164	2.00	2.87 ⁺	2.36**	11.6%**	2.00	2.71	2.21***	10.4%*
High income	156	2.00	1.85	1.31	3.2%	2.00	1.81	1.27	3.2%
Old age	191	2.00	2.22	1.67	5.8%	2.00	2.15	1.61	5.2%
Young age	135	2.00	2.67	2.20	10.4%	2.00	2.54	2.06	9.6%+
Female	159	2.00	2.48	2.05 ⁺	9.4%	2.00	2.32	1.89 ⁺	8.2%
Male	167	2.00	2.33	1.74	6.0%	2.00	2.29	1.71	6.0%
<i>'Inflation' question wording in web survey mode</i>									
No college	218	1.50	3.65	3.41***	8.7%**	1.50	2.21	1.98***	6.4%**
College	145	1.50	1.58	1.05	1.4%	1.50	1.49	1.01	0.7%
Low income	172	1.50	3.84	3.59***	9.9%***	1.50	2.49	2.26***	8.1%***
High income	179	1.50	1.88	1.44	1.7%	1.50	1.38	0.97	0.6%
Old age	188	1.50	3.00	2.51	5.9%	1.50	1.89	1.42	4.3%
Young age	175	1.50	2.63	2.43	5.7%	1.50	1.96	1.78	4.0%
Female	157	1.30	4.07	3.72***	11.5%***	1.00	2.54	2.23***	8.3%***
Male	206	1.50	1.87	1.52	1.5%	1.50	1.45	1.11	1.0%

Note: Income and age groups reflect median-split; M-W tests applied to test for demographic group difference in means and χ^2 to percentages; ⁺ $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$

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