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## Expectations of Inflation: The Role of Demographic Variables, Expectation Formation, and Financial Literacy

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**When financial decisions have consequences beyond the immediate future, individuals' economic success may depend on their ability to forecast the rate of inflation. Higher inflation expectations have been reported by individuals who are female, poorer, single and less educated. Our results suggest that these demographic differences in inflation expectations may be partially explained by variations in expectation formation and financial literacy. Specifically, higher inflation expectations were reported by individuals who focused more on how to cover their future expenses and on prices they pay (rather than on the US inflation rate) and by individuals with lower financial literacy.**

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In the course of everyday life, people make a variety of financial decisions about saving, investing and borrowing, among other things. When their effects extend into the future, financial decisions require accurate assessments of inflation rates. Inflation expectations have been studied by economists, psychologists, marketing scientists and others concerned about individuals' financial wellbeing and the impacts of their choices

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on the economy. Indeed, individuals' perceptions and expectations of inflation may affect actual realized inflation and other economy-wide outcomes (Katona 1975). A better understanding of these inflation expectations can help economists and central bankers to improve their forecasts of future macroeconomic trends and formulate monetary policy.

Indirect measures of public inflation expectations have been derived from the behavior of prices for inflation-indexed securities, economists' forecasts and past inflation trends. Although complex inferences are needed to derive inflation expectations from these measures, surveys can be used to directly elicit people's inflation expectations (Blanchflower and Coille 2009; Bryan and Venkatu 2001b; Curtin 1996; Jonung 1981; Ranyard et al. 2008). Median responses in these surveys sometimes outperform professional and model-based forecasts in predicting actual inflation (Ang, Bekaert, and Wei 2007; Hafer and Hein 1985; Thomas 1999). However, some demographic groups report systematically higher, and seemingly unrealistic, inflation expectations. Those groups include individuals who report less income and no college education, as well as those who are single, female and belong to racial and ethnic minorities (Bryan and Venkatu 2001a, 2001b; Jonung 1981). Reported relationships between age and inflation expectations have been inconsistent, with some studies finding higher inflation expectations among younger respondents (Bryan and Venkatu 2001b; Jonung 1981) and others finding higher expectations among older respondents (Blanchflower and Coille 2009; Lombardelli and Saleheen 2003). Studies using regression models controlling for interrelationships between demographic variables suggest that inflation expectations are mostly driven by older age and measures of lower socio-economic status such as reporting less education, less income and living in public housing (Blanchflower and Coille 2009; Lombardelli and Saleheen 2003).

One explanation proposed for demographic differences in reported inflation expectations is that individuals from population groups who report higher inflation expectations also experience a relatively higher rate of inflation in their actual consumption. For example, the elderly may experience a higher rate of inflation due to their health care expenditures (Hobijn and Lagakos 2003; McGranahan and Paulson 2006). However, even though the rate of inflation varies widely across product categories,<sup>1</sup>

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1. UK data for December 2006 showed that the overall annual consumer price index (CPI) increase of 3.0% included rates of -4.1% for clothing and footwear, 4.6% for food and 14.0% for education (Office for National Statistics 2008). US data for the same period showed that the overall CPI increase of 3.2% included rates of -0.7% for communication, 2.4% for food and 6.2% for education (Bureau of Labor Statistics 2008).

actual inflation experiences of individual households do not seem to vary much. For example, Hobijn et al. (2009) reported that between 1995 and 2005, annual inflation rates experienced varied by only .2% to .4% across different demographic groups (see also Kokosi 2000).

Here, we considered three possible explanations for demographic differences in inflation expectations. First, we examined whether individuals who report higher inflation expectations reveal systematic differences in *how they form their inflation expectations*. Bruine de Bruin et al. (2008) found considerable variability in the factors people considered when forming their inflation expectations. In addition to thinking about the US inflation rate, they also reported thinking about their personal experiences with prices they pay. Psychological theories suggest that larger price changes are usually more salient than smaller ones, and that increasing prices are usually more salient than decreasing or stable ones (Bruine de Bruin et al. 2008; Brachinger 2008; Fluch and Stix 2005; Jungermann et al. 2007; Kahneman and Tversky 1979). As a result, individuals who think relatively more about their personal experience with prices, compared with the US inflation rate, may give higher inflation expectations.

Second, we examined whether individuals who report higher inflation expectations have *shorter financial planning horizons*. Low-income populations tend to be more myopic when making financial decisions (e.g., Zikmund-Fisher and Parker 1999). Such a near-term focus could make them more sensitive to transient price shocks as well as less informed about the longer-term price trends captured in the inflation rate. As a result, they may experience more uncertainty about what levels of inflation to expect, leading to more volatile inflation expectations. Indeed, density forecasts have suggested less uncertainty about future inflation among men (vs. women), among individuals with (vs. without) a college education, for married (vs. single) individuals and for those with higher (vs. lower) levels of income—and that those with less uncertainty gave less volatile point estimates of inflation expectations (in terms of making smaller absolute revisions of their forecast) over time (VanderKlaauw et al. 2008).

Perhaps because inflation is more typical than deflation, inflation expectations tend to have an implicit lower bound of 0%, with only 3% of the 200,000 responses to the Michigan Survey of Consumers given between 1978 and 2004 being below 0% (Blanchflower and Coille 2009; Curtin 1996, 2006; Lombardelli and Saleheen 2003). The resulting floor effect would bias inflation expectations upward, among those whose translation process is noisier.

Third, we examined whether higher inflation expectations are reported by individuals with lower levels of *financial literacy*, or ability to understand financial numbers and information (Delavande, Rohwedder, and Willis 2008; Lusardi 2008; Lusardi and Mitchell 2005, 2007, 2008; van Rooij, Lusardi, and Alessie 2007). Studies have found lower financial literacy in all of the population groups that overestimate inflation: women, single people, racial and ethnic minorities and those without a college education (Ginde et al. 2008; Lusardi 2008; Lusardi and Mitchell 2005, 2007, 2008; McCormack et al. 2009). If individuals with lower levels of financial literacy have greater difficulty in assessing inflation expectations, their expectations may be more variable, tending to skew their judgments upward, for the reasons discussed earlier.

This study examined these three hypotheses, predicting that higher inflation expectations would be reported by individuals who (1) focused on their expenses and the prices they pay when forming their inflation expectations, (2) had shorter financial planning horizons and (3) had lower financial literacy. We further examined whether these relationships explained demographic differences in inflation expectations.

## METHOD

### Sample

We conducted a Web-based survey with RAND's American life panel (ALP), whose members were recruited from respondents participating in the Michigan Survey of Consumers in 2007. These survey respondents were originally reached through random-digit dialing. Those who indicated willingness to participate in Web-based surveys and gave consent to have their information transferred were contacted by RAND and provided with Web TV if they did not have Internet access.

A random sample of 740 ALP panel members were invited to participate in the ALP's 16th monthly survey. Of those, 613 completed the survey (82.8% response rate). Our sample included 299 respondents randomly assigned to receive the questions analyzed here. The survey was fielded between December 22, 2007, and May 20, 2008; 41.8% completed it by December 31, 2007 and 84.6% by January 31, 2008. Ages ranged from 19 to 82 ( $M = 47.4$ ,  $SD = 14.3$ ), with a median of 48. In total, 54.5% were female, 70.6% were married or living with a partner, 59.9% had at least a bachelors degree and 86.6% were white. The median reported income range was \$60,000 to \$75,000, with 45.5% reporting incomes more than \$75,000.

Over the entire period that the survey was online, the monthly samples of the Michigan Survey of Consumers included 53.4%–59.4% females, 58.0%–64.7% married or living with a partner, 64.4%–69.9% with at least a bachelors degree, 36.1%–43.6% reporting income more than \$75,000, 61.3%–64.4% aged 48 or older and 79.6%–83.7% white. Compared with the ranges observed for the Michigan sample, our sample was slightly more likely to be married or living with a partner, slightly less likely to have a college education, somewhat younger, and slightly more likely to be white.

### Procedure

Respondents received \$20 for answering the entire Internet survey, which included the measures described below, and took about 35 minutes to complete. Although respondents were allowed to skip questions, those who tried to do so received a prompt encouraging them to provide an answer. Respondents reported their race, marital status, highest level of education completed, age, gender and total combined income<sup>2</sup> across all family members over the past 12 months.

### *Inflation Expectations*

Respondents received an adaptation of the Michigan Survey of Consumers question (Curtin 1996): “During the next 12 months, do you think that prices in general will go up, or go down or stay where they are now?” with the response options of “Go up,” “Stay the same” and “Go down.” Those who responded “Stay the same” were asked whether they meant that prices would go up at the same rate, or that prices would not go up. Those who chose “go up at the same rate” were categorized as having indicated that prices would increase. Those who indicated expectations for prices to go up or down were asked by what percent, and to give “your best guess or your best guess for a range.” Those who provided only the lower or upper bound of a range were prompted to complete the other. Those who provided a range then were asked for a best guess. Here, we report only on the point estimates given as a “best guess.”

Following the Michigan Survey of Consumers procedure, respondents who gave a best guess greater than 5% were given the opportunity to revise their answer, with the prompt, “Let me make sure I have

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2. Income was specified as “including money from jobs, net income from business, farm, or rent, pensions, dividends, interest, social security payments and any other money income received by members of your family who are 15 years of age or older.”

that correct. You said that you expect prices to go up during the next 12 months by [*repeat response*] percent. Is that correct?" Finally, those who did not give a best guess or a range were asked, "How many cents on the dollar do you expect prices to go [up/down] on the average, during the next 12 months?"

### *Forming Inflation Expectations*

Respondents were asked what they thought the inflation expectations question was "asking for the most." Response options (shown in Table 2) reflect topics mentioned in cognitive interviews asking participants to think aloud while generating inflation expectations (Bruine de Bruin et al. 2008). Respondents then rated how much they had thought about each topic, which they "may or may not have thought of" when generating their inflation expectations, on a scale from 1 (not at all) to 7 (very much).

### *Financial Planning Horizon*

Respondents were asked "In planning your [family's] spending, which of the following time periods is most important to you?" Response options ranged from the next day (= 1) to longer than 10 years (=10). A parallel question asked about decisions concerning how much income to save.

### *Financial Literacy and Confidence*

Table 1 shows the financial literacy items. Five items were selected because they directly measured understanding of inflation (Delavande, Rohwedder, and Willis 2008; Lusardi and Mitchell 2007; van Rooij, Lusardi, and Alessie 2007). Because understanding numbers (referred to as numeracy) is essential to understanding inflation, we included three items measuring basic numeracy (Peters et al. 2006; Schwartz et al. 1997) and eight items measuring advanced numeracy (Lipkus, Samsa, and Rimer 2001; Lusardi and Mitchell 2007; Peters et al. 2006). The selected items used true/false, open-ended and multiple-choice formats.

Financial confidence reflects how individuals rate their financial literacy. It is associated with better financial and general life outcomes even after accounting for financial knowledge (Bruine de Bruin, Parker, and Fischhoff 2007; Parker and Fischhoff 2005; Parker et al. 2008). Confidence assessment has a long history in decision-making research (e.g., Keren 1991; Lichtenstein and Fischhoff 1977; Yates 1990). We used a common procedure to assess confidence (Parker et al. 2008). After answering each true/false statement on the financial literacy measure

TABLE 1  
*Financial Literacy Questions*

Item	Source <sup>a</sup>	Percent Correct	Item-Total Correlation
1. True/False: Your friend Lisa inherited \$10,000 today and her brother, Robert, will inherit \$10,000 three years from now. Lisa's inheritance and Robert's inheritance are essentially of equal value.	1	83.9	.44***
2. True/False: If your income doubles in the next 10 years and prices of all goods also double, then you will be able to buy fewer goods in 10 years than you can buy today.	1	74.2	.43***
3. True/False: If the interest rate on your savings account is 1% per year and inflation is 2% per year, after one year, you will be able to buy more with the money in this account than you are able to buy today.	1, 2	94.6	.25***
4. True/False: It is better for young people saving for retirement to combine stocks with long-term (inflation protected) bonds than with short-term (inflation protected) bonds. <sup>a</sup>	1	77.6	.16**
5. True/False: If prices go up very rapidly, the money people have in savings accounts could lose much of its value.	1	81.9	.30***
6. Imagine that we roll a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up as an even number?	3, 4	71.9	.46***
7. In the BIG BUCKS LOTTERY, the chances of winning a \$10.00 prize are 1%. What is your best guess about how many people would win a \$10.00 prize if 1,000 people each buy a single ticket from BIG BUCKS?	3, 4	72.9	.51***
8. In the ACME PUBLISHING SWEEPSTAKES, the chance of winning a car is 1 in 1,000. What percent of tickets of ACME PUBLISHING SWEEPSTAKES win a car?	3, 4	29.8	.54***
9. Which of the following numbers represents the biggest risk of getting a disease? (a) 1 in 100; (b) 1 in 1000; (c) 1 in 10	4, 5	91.3	.42***
10. Which of the following numbers represents the biggest risk of getting a disease? (a) 1%; (b) 10%; (c) 5%	4, 5	94.0	.39***
11. If Person A's risk of getting a disease is 1% in 10 years, and Person B's risk is double that of A's, what is B's risk?	4, 5	79.3	.59***
12. If Person A's risk of getting a disease is 1 in 100 in 10 years, and Person B's risk is double that of A, what is B's risk?	4, 5	70.9	.62***
13. If the chance of getting a disease is 10%, how many people would be expected to get the disease . . . out of 100?	4, 5	94.6	.46***
14. . . out of 1000?	4-6	92.0	.38***
15. If the chance of getting a disease is 20 out of 100, this would be the same as having a ___% chance of getting the disease.	4, 5	83.9	.56***
16. The chance of getting a viral infection is .0005. Out of 10,000 people, about how many of them are expected to get infected?	4, 5	61.9	.44***

<sup>a</sup>Items were taken from the following sources: (1) Delevande, Rohwedder, and Willis (2008); (2) Lusardi and Mitchell (2008); see also van Rooij, Lusardi, and Alessie (2007); (3) Schwartz et al. (1997); (4) Lipkus, Samsa, and Rimer (2001); (5) Peters et al. (2006) and (6) Lusardi and Mitchell (2007). Item #4 was deleted from the reported analyses.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

(Table 1), respondents indicated their confidence in their answer, on a scale anchored at 50% (just guessing) and 100% (absolutely sure).

## RESULTS

### Inflation Expectations

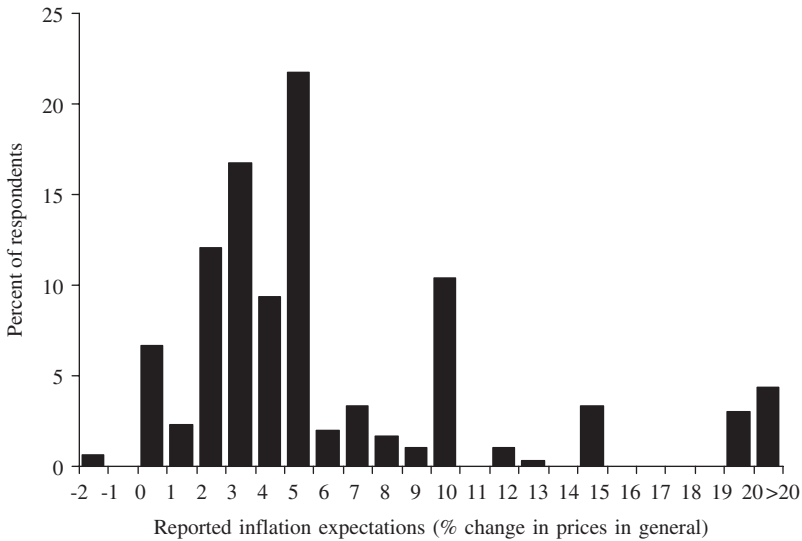
The mean reported expectation for prices in general over the next 12 months was 6.73% (SD = 9.02), with a median of 5.0%. Among the respondents who completed the survey by January 31, 2008, the median was 4.0%, slightly higher than the raw median of 3% and the imputed median of 3.4% observed with the Michigan Survey of Consumers for both December 2007 and January 2008. However, we cannot make a confident comparison, because we do not know the exact interpolation and sample weighting method used to compute Michigan's median from the individual, usually integer, responses or the imputation of missing responses (VanderKlaauw et al. 2008).<sup>3</sup> The overall distribution (see Figure 1) showed strong positive skewness (5.33), indicating the mean was higher than the median, and strong positive kurtosis (43.04), suggesting a relatively flat and long-tailed distribution. We dealt with these extreme values in two ways, using both conceptualizations in all of the reported analyses, and finding similar patterns of results in most cases. First, we examined *reported inflation expectations*, after removing twelve extreme outliers, defined as values that exceeded the 75th percentile by more than three times the interquartile range (Frigge, Hoaglin, and Iglewicz 1989), here equal to 23%. Doing so reduced skewness (1.59) and kurtosis (2.78), as well as the mean (5.37) and standard deviation (4.47), with the median remaining at 5%. Second, we created a *binary measure* reflecting whether or not respondents gave inflation expectations greater than 5%, retaining all responses. We chose 5% as a threshold for unusually high expectations, because (1) the Michigan Survey of Consumers treats inflation expectations over 5% as suspect, offering respondents who report such expectations an opportunity to revise their answer (Curtin 1996), (2) the CPI has not been above 5% since 1990 (Bryan and Venkatu 2001b) and (3) median inflation expectations have

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3. Our sample was slightly less likely to have a college education, which may have contributed to the somewhat higher median inflation expectations reported in the Michigan Survey of Consumers. However, other unobserved differences between samples, as well as variations in survey administration (such as using a self-assisted online computer survey at the RAND ALP vs. telephone interviews at the Michigan Survey of Consumers) also may have played a role (VanderKlaauw et al. 2008).



FIGURE 1  
*Histogram of Expectations for Changes in Prices in General over the Next 12 Months*



Note: Reported inflation expectations greater than 20% were combined in the “>20” category, with expectations ranging from 23 to 100%.

not been above 5% since the mid-1980s (Bryan and Venkatu 2001b). Overall, 30.4% of our sample gave values greater than 5%.

### Forming Inflation Expectations

Table 2 shows respondents’ ratings of how much they thought about each of ten topics when forming their inflation expectations. The ratings are presented in decreasing order. Six were above the scale midpoint of 3.50, including ratings of how much respondents thought about prices they pay ( $t(298) = 23.51, p < .001$ ), prices Americans pay ( $t(298) = 17.60, p < .001$ ), changes in the cost of living ( $t(298) = 12.64, p < .001$ ), the US inflation rate ( $t(297) = 9.78, p < .001$ ), specific prices ( $t(298) = 2.51, p < .05$ ) and how their life will change ( $t(297) = 1.84, p = .07$ ). Although these ratings suggested that respondents thought about various topics when forming their inflation expectations, the majority seemed to interpret the inflation expectations question in ways consistent with economic definitions. When asked what the inflation expectations question was asking about the most, respondents selected prices Americans pay (39.5%), prices they pay (21.4%), changes in the cost

TABLE 2  
*Topics Respondents Thought About When Forming Inflation Expectations*

Topic	Mean (SD) Rating <sup>a</sup> by Selected Question Topic				
	Mean (SD) Rating <sup>a,b</sup>	Percent Who Selected as Main Question Topic <sup>c</sup>	Those Who Selected It	Those Who Did Not Select It	Mann-Whitney (z) <sup>d</sup>
Prices you pay	5.70*** (1.62)	21.4	6.55 (1.02)	5.46 (1.67)	-5.46***
Prices Americans pay	5.33*** (1.80)	39.5	6.23 (1.01)	4.75 (1.96)	-6.86***
Changes in cost of living	4.86*** (1.86)	17.1	6.25 (.89)	4.58 (1.88)	-6.27***
US inflation rate	4.61*** (1.97)	15.1	6.53 (.87)	4.27 (1.91)	-7.73***
Specific prices	3.81* (2.13)	1.7	6.60 (.89)	3.76 (2.11)	-2.99**
How your life will change	3.72 <sup>†</sup> (2.05)	.3	4.00 (—)	3.72 (2.05)	N/A
How to cover expenses	3.66 (2.24)	1.0	6.67 (.58)	3.63 (2.23)	-2.30*
Annual raises	3.13 (1.96)	.7	5.00 (2.82)	3.12 (1.95)	-1.35
Seasonal changes in prices	2.57 (1.71)	.3	2.00 (—)	2.57 (1.71)	N/A
How to pay for loans and debts	2.99 (2.13)	.0	—	2.99 (2.13)	N/A

<sup>a</sup>Ratings of how much respondents thought of these topics.

<sup>b</sup>For each topic, a one-sample *t*-tests examined whether the mean rating was significantly different from the scale midpoint of 3.50.

<sup>c</sup>An additional "other" option was used by 2.9% of respondents.

<sup>d</sup>Except for ratings of annual raises, Levene's test for equality of variances showed significant group differences in variances for each of these ratings ( $p < .01$ ). Hence, we used the nonparametric Mann-Whitney test (Siegel and Castellan 1988) to examine group differences in mean ratings.

<sup>†</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

of living (17.1%) and the US inflation rate (15.1%). Overall, respondents who selected a topic as the main focus of the inflation expectations question also gave higher ratings of how much they thought about it when forming their inflation expectation, suggesting consistency across measures. Subsequent analyses focused on the ratings of how much respondents thought about each topic when forming their expectations, rather than their choice of main question topic, because (1) how respondents formed their inflation expectations was the main focus of one of our hypotheses, (2) the ratings provided more information and (3) the ratings allowed us to conduct the factor analysis described below.

TABLE 3

*Factor Analysis on Ratings of How Much Respondents Thought About Topics When Forming Inflation Expectations*

Question Interpretation	Factor 1: Personal Finances	Factor 2: General Indicators	Factor 3: Prices You Pay
Prices you pay	.17	-.03	<u>.94</u>
Prices Americans pay	.01	.12	.38
Changes in cost of living	.25	.58	.13
US inflation rate	.06	<u>.63</u>	.18
Specific prices	.26	.26	.05
How your life will change	.79	.23	.15
How to cover expenses	<u>.88</u>	.18	.10
Annual raises	.35	.26	.13
Seasonal changes in prices	.26	.43	.02
How to pay for loans and debts	.79	.19	.00
Eigenvalue	3.27	1.30	1.21
Percent variance explained (%)	32.7	13.0	12.0

Note: This table presents the structure matrix for the principal factor analysis with varimax rotation. For each factor, the highest loading is underlined.

The ten ratings were highly correlated, with Pearson correlations ranging from .02 to .74 and a median correlation of .20. To reduce the large number of correlated ratings, we conducted a principal axis factor analysis with a varimax rotation to identify orthogonal factors. Table 3 shows the three resulting factors, which resembled those found by Bruine de Bruin et al. (2008). The first factor involved topics regarding respondents' personal financial situation, with the highest loading (.88) for ratings of how much respondents thought about how to cover their expenses next year. Other high loadings reflected how much they thought of how to pay for loans and debts as well as how their life will change over the next year. The second factor seemed to reflect general indicators of inflation, with the highest loading for ratings of how much respondents thought of the US inflation rate (.63), and the second highest loading for changes in the cost of living (.58). The highest loading on the third factor (.94) reflected ratings of how much respondents thought about the prices of things they usually spend money on. In the reported analyses, we represented each factor with the item that had the highest loading. Replacing it with the average across high-loading items for each factor did not affect the overall pattern of results discussed below.

We computed Spearman rank correlations between reported inflation expectations and respondents' ratings of how much they thought about the topics representing the three factors. Ratings of how much respondents thought about how to cover expenses (Factor 1) were positively

correlated with reported inflation expectations ( $r_s = .19, p < .001$ ) and with the binary measure of whether expectations were greater than 5% ( $r_s = .15, p < .01$ ). Ratings of how much respondents thought about prices they pay (Factor 3) also were positively correlated with reported inflation expectations ( $r_s = .11, p < .05$ ) and the binary measure ( $r_s = .17, p < .05$ ). In contrast, ratings of how much respondents thought about the US inflation rate (Factor 2) were not significantly correlated with reported expectations ( $r_s = .07, p = .22$ ) or the binary measure ( $r_s = .00, p = .99$ ).

### Financial Planning Horizon

The two questions asking about respondents' planning horizons for spending and saving decisions had good internal consistency, with a Cronbach's (1951) alpha of .74. Responses to the two questions were averaged ( $M = 5.46, SD = 1.86$ ). Individuals with lower composite scores, indicating shorter financial planning horizons, did not report significantly higher inflation expectations ( $r_s = -.08, p = .20$ ) but were more likely to report expectations greater than 5% ( $r_s = -.13, p < .05$ ).

### Financial Literacy and Confidence

Table 1 reports descriptive statistics for responses to the financial literacy items. The percent of respondents answering each item correctly varied from 29.8% (Item 8) to 94.6% (Items 3 and 13). The items reliably measured a common underlying construct; Cronbach's (1951) alpha was .71. Removing one item (#4) with a very low item-total correlation increased Cronbach's alpha to .73. Removing additional items did not improve it further. A factor analysis with oblimin rotation, allowing correlated factors, suggested a three-factor solution (Tabachnick and Fidell 1989). The three factors had eigenvalues of 3.38, 1.62 and 1.27, explaining 22.5%, 10.8% and 8.5% of the variance, respectively. However, the factors had no ready interpretation, considering their topic, source (Table 1) or response mode. As a result, our analyses used one overall score reflecting the percent of correct answers to the items shown in Table 1 (excluding Item #4).

Financial confidence was calculated across the four of the five true/false financial literacy questions (excluding Item #4).<sup>4</sup> Cronbach's

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4. Financial confidence was significantly related to self-ratings of financial knowledge ( $r = .19, p < .01$ ). Replacing our measure of financial confidence with these self-ratings does not affect the results reported in Table 5 ( $\alpha = .10$ ).

(1951) alpha was .78, indicating good internal consistency. Mean confidence was 85.3% (SD = 12.2), only slightly higher than the 83.7% (SD = 20.2) correct responses across these same items, indicating appropriate confidence. Financial confidence was significantly correlated with total financial literacy scores ( $r_s = .33, p < .001$ ), indicating that respondents who knew more also had greater confidence in their knowledge.

As expected, respondents with lower financial literacy scores reported higher inflation expectations ( $r_s = -.21, p < .001$ ) and were more likely to report expectations greater than 5% ( $r_s = -.26, p < .001$ ). However, those reporting lower financial confidence did not report higher inflation expectations ( $r_s = -.07, p = .26$ ) nor were they more likely to report inflation expectations greater than 5% ( $r_s = -.05, p = .38$ ).

### Demographic Differences

Table 4 presents the demographic categories previously found to be correlated with inflation expectations. For education, income, age and financial literacy, we created two groups, reflecting individuals reporting values above and below the median of that variable. Levene's test for inequality of variances showed that there was significantly more disagreement between the inflation expectations of respondents with lower (vs. higher) levels of education ( $F(1, 285) = 15.98, p < .001$ ), lower (vs. higher) income ( $F(1, 284) = 5.42, p < .05$ ) and lower (vs. higher) financial literacy ( $F(1, 285) = 21.98, p < .001$ ) (Table 4). As a result, we used nonparametric Mann-Whitney (M-W) tests to compare groups' inflation expectations (Siegel and Castellan 1988). Chi-square tests examined group differences in reporting expectations greater than 5%. Spearman rank correlations examined relationships of both measures of inflation expectations with the continuous variables for age and financial literacy (Siegel and Castellan 1988).

Consistent with previous research, inflation expectations were higher among respondents who were nonwhite ( $z = 1.81, p < .10$ ), single ( $z = 1.65, p < .10$ ), less educated ( $z = 1.96, p < .10$ ) and poorer ( $z = 2.06, p < .05$ ). Expectations greater than 5% were more likely for respondents who were less educated ( $\chi^2(1) = 7.22, p < .01$ ) and had lower income ( $\chi^2(1) = 9.08, p < .01$ ), but not for other demographic groups. We did not find significantly higher inflation expectations for women ( $p < .10$ ), although results were in the expected direction.

Older adults reported higher inflation expectations ( $r_s = .12, p < .10$ ), with a seemingly monotonic trend over the four age quartiles, with

TABLE 4  
Descriptive Statistics by Demographic Groups and Financial Literacy

	Inflation Expectations		M (SD) of Ratings of Formation of Inflation Expectations				M (SD)		
	Percent	M (SD)	Percent > 5% Cover Expenses	How to Cover Expenses	Prices You Pay	US Inflation Rate	Financial Planning Horizon	Financial Literacy	Financial Confidence
All	100.0	6.73 (9.02)	30.4	3.66 (2.24)	5.70 (1.62)	4.61 (1.97)	5.46 (1.86)	78.48 (17.29)	85.33 (12.19)
Nonwhite	13.4	6.30 <sup>†</sup> (4.65)	40.0	3.58 (2.24)	5.25 (1.96)	4.78 (1.95)	5.14 (2.24)	73.00 <sup>†</sup> (20.86)	86.13 (13.55)
White	86.6	5.24 (4.44)	29.0	3.68 (2.24)	5.76 (1.55)	4.59 (1.97)	5.51 (1.79)	79.33 (16.57)	85.20 (11.99)
Single	29.4	5.88 <sup>†</sup> (4.36)	34.1	3.59 (2.22)	5.73 (1.61)	4.19* (2.02)	4.86*** (1.91)	76.52 <sup>†</sup> (16.17)	83.04* (12.44)
Married or living with a partner	70.6	5.16 (4.51)	28.9	3.69 (2.25)	5.68 (1.62)	4.79 (1.92)	5.71 (1.78)	79.30 (17.72)	86.28 (11.99)
At most high school diploma <sup>a</sup>	40.1	6.21 <sup>†</sup> (5.27)	39.2**	4.13** (2.24)	5.76 (1.53)	4.60 (2.06)	5.10* (2.03)	71.16*** (18.89)	84.33 (12.24)
More than high school diploma	59.9	4.84 (3.80)	24.6	3.35 (2.18)	5.65 (1.67)	4.63 (1.90)	5.70 (1.70)	83.39 (14.21)	85.99 (12.15)
Low income <sup>a</sup> (<\$75k)	55.0	5.90* (4.73)	37.8**	3.86 <sup>†</sup> (2.25)	5.82 (1.55)	4.44 (2.08)	5.07*** (1.86)	75.04*** (17.67)	82.96** (13.21)
High income (≥\$75k)	45.0	4.80 (4.10)	21.6	3.41 (2.21)	5.55 (1.68)	4.82 (1.80)	5.95 (1.75)	83.88 (15.78)	88.34 (10.06)
Younger adults (18–47 years old) <sup>a</sup>	50.8	5.13 <sup>†</sup> (4.42)	27.6	3.82 (2.08)	5.84 (1.54)	4.55 (2.00)	5.28 (1.92)	77.24 (17.69)	82.57*** (12.14)
Older adults (48–82 years old)	49.2	5.62 (4.53)	33.3	3.50 (2.39)	5.54 (1.68)	4.68 (1.93)	5.65 (1.78)	79.77 (16.85)	88.18*** (11.61)
Female	54.5	5.55 (4.48)	32.5	3.87 (2.25)	5.69 (1.59)	4.36* (2.02)	5.37 (1.89)	74.68*** (16.01)	81.98*** (12.31)
Male	45.5	5.16 (4.47)	27.9	3.42 (2.21)	5.70 (1.65)	4.92 (1.86)	5.58 (1.82)	83.03 (17.74)	89.34 (10.79)
Low financial literacy (≤80) <sup>a</sup>	52.2	6.37*** (4.99)	41.0***	4.03** (2.28)	5.71 (1.60)	4.33 <sup>†</sup> (2.07)	5.13*** (1.95)	65.59*** (14.14)	81.47*** (12.98)
High financial literacy (>80%)	47.8	4.34 (3.61)	18.9	3.27 (2.12)	5.69 (1.63)	4.92 (1.81)	5.83 (1.68)	92.54 (5.34)	89.53 (9.66)

Note: Nonparametric Mann–Whitney tests (Siegel and Castellan 1988) examined group differences in continuous variables, and chi-square tests examined group differences in dichotomous variables. Significance levels for age and financial literacy were based on Spearman rank correlations with the full-range variables.

<sup>a</sup>Groups are based on a median split.

<sup>†</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

means of 4.89 (SD = 4.79) for respondents younger than 36, 5.24 (SD = 4.11) for ages 36–46, 5.54 (SD = 4.49) for ages 47–57 and 5.76 (SD = 4.55) for those over 57. There was a similar pattern for the percent of respondents reporting expectations greater than 5% (23.5%, 29.3%, 36.4% and 31.7%, respectively). However, age was not significantly correlated with the binary measure ( $r_s = .09, p > .10$ ).

There also were some demographic differences in how respondents formed their inflation expectations, with singles (vs. those who were married or living with a partner) giving lower ratings for how much they thought about the US inflation rate (M–W  $z = -2.37, p < .001$ ), and respondents with lower levels of education (M–W  $z = 3.05, p < .01$ ) and income (M–W  $z = -1.80, p = .07$ ) thinking more about how to cover their expenses. Single (M–W  $z = -3.52, p < .001$ ), less educated (M–W  $z = -2.54, p < .05$ ) and poorer (M–W  $z = -3.95, p < .001$ ) respondents reported shorter financial planning horizons.

Most demographic groups reporting higher inflation expectations also had lower financial literacy, including respondents who were nonwhite ( $z = -1.77, p = .08$ ), single ( $z = -1.77, p = .08$ ), less educated ( $z = -5.79, p < .001$ ), lower income ( $z = -4.26, p < .001$ ) and female ( $z = -5.38, p < .001$ ). Financial literacy was unrelated to age ( $p > .10$ ). Similar group differences were observed for financial confidence (Table 4), which was lower for respondents who were single ( $z = -2.25, p < .05$ ), had lower incomes ( $z = -3.42, p < .001$ ), were younger ( $r_s = .22, p < .001$ ) and were female ( $z = -5.68, p < .001$ ).

The last two rows of Table 4 correlate financial literacy with other measures. As reported above, respondents with lower financial literacy reported higher expectations ( $r_s = -.21, p < .001$ ) and were more likely to report expectations greater than 5% ( $r_s = -.26, p < .001$ ). Respondents with lower financial literacy thought more about covering expenses ( $r_s = -.19, p < .01$ ) and marginally less about the US inflation rate when forming inflation expectations ( $r_s = .11, p = .06$ ). They had significantly shorter financial planning horizons ( $r_s = .21, p < .001$ ) and lower financial confidence ( $r_s = .38, p < .001$ ).

### Linear Regression Predicting Inflation Expectations

We conducted linear regression analyses to examine the relative contributions of the different variables. The left panel of Table 5 shows a linear regression predicting reported inflation expectations, adding demographic variables in Model 1, ratings for what respondents thought about when forming their inflation expectations and their financial

TABLE 5  
Regression Models Predicting Inflation Expectations

	Linear Regression Predicting Inflation Expectations ( $\beta$ )			Logistic Regression Predicting Whether Inflation Expectations Were Greater Than 5% (Odds Ratio, 95% Confidence Interval)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Thoughts about how to cover expenses <sup>a</sup>	—	.12*	.14*	—	1.10 (.97, 1.25)	1.08 (.95, 1.22)
Thoughts about the inflation rate <sup>a</sup>	—	.02	.03	—	.99 (.86, 1.13)	.98 (.86, 1.14)
Thoughts about prices you pay <sup>a</sup>	—	.16*	.13*	—	1.48** (1.06, 2.07)	1.34** (1.10, 1.64)
Financial planning horizon	—	-.04	.00	—	.91 (.79, 1.06)	.95 (.81, 1.11)
Financial literacy	—	—	-.25***	—	—	.97** (.95, .99)
Financial confidence	—	—	.02	—	—	1.00 (.98, 1.03)
Race (nonwhite)	.09	.11 <sup>†</sup>	.07	1.80 (.87, 3.71)	2.11 <sup>†</sup> (.99, 4.49)	1.85 (.85, 4.04)
Marital status (single)	.04	.05	.06	.92 (.50, 1.69)	.88 (.46, 1.66)	.94 (.49, 1.80)
Education (at most high school)	.12*	.08	.01	1.71* (1.01, 2.87)	1.50 (.87, 2.59)	1.13 (.63, 2.02)
Income (<75k)	.08	.05	.02	1.99* (1.13, 3.48)	1.74 <sup>†</sup> (.98, 3.10)	1.59 (.88, 2.89)
Gender (female)	.06	.05	.00	1.28 (.74, 2.20)	1.28 (.73, 2.25)	1.05 (.58, 1.91)
Age <sup>b</sup>	.11 <sup>†</sup>	.13*	.12*	1.02 <sup>†</sup> (1.00, 1.04)	1.02* (1.00, 1.04)	1.02* (1.00, 1.04)
R <sup>2</sup>	.05	.10	.15	.09	.14	.19
Test of change	F(6, 278) = 2.52, p < .05	F(4, 274) = 3.87, p < .01	F(2, 272) = 7.38, p < .001	$\chi^2$ (6) = 18.87, p < .01	$\chi^2$ (4) = 12.71, p < .05	$\chi^2$ (2) = 11.08, p < .01

<sup>a</sup>Ratings reflect how much respondents indicated thinking of these topics when generating their inflation expectations.

<sup>b</sup>The full-range variable was used as a predictor.

<sup>†</sup>p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001.



planning horizons in Model 2, and financial literacy and confidence scores in Model 3.

In the first model ( $R^2 = .05$ ), education was the only demographic variable that remained significantly related to higher inflation expectations after controlling for the other demographic variables, with a marginal relationship for older age. The second model had greater predictive power ( $R^2 = .10$ ), with ratings of how much respondents thought about how to cover expenses and prices they pay being significantly related to higher inflation expectations, and education no longer being significant. The third model explained yet more variance ( $R^2 = .15$ ), finding significantly higher inflation expectations for respondents with lower financial literacy scores. Adding financial literacy further reduced the coefficients of some demographic variables, most notably education, income and gender. Thus, individuals' financial literacy, and how they form inflation expectations, may help to explain the relationship between demographic variables and inflation expectations.

The right panel of Table 5 shows the results of a logistic regression predicting the binary measurement of whether respondents reported inflation expectations greater than 5%. The results paralleled those of the linear regression, with education and income the significant demographic predictors in Model 1, and respondents' ratings of how much they thought about prices they pay (added in Model 2) and financial literacy scores (added in Model 3) explaining the relationship between demographic variables and giving inflation expectations greater than 5% (Table 5).<sup>5</sup>

## DISCUSSION

Median inflation expectations on consumer surveys have outperformed professional and model-based forecasts (Ang, Bekaert, and Wei 2007; Hafer and Hein 1985; Thomas 1999), but concealed systematic demographic differences (Blanchflower and Coille 2009; Bryan and Venkatu 2001a, 2001b; Jonung 1981; Lombardelli and Saleheen 2003). Generally replicating previous results, we found relatively higher inflation expectations among respondents who were nonwhite (vs. white), single (vs. married or living with a partner), low (vs. high) income, at

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5. For both regressions (Table 5), replacing ratings of how much respondents thought about how to cover future expenses, the US inflation rate and prices they pay with the corresponding dichotomous measures of whether or not respondents selected these topics as the main focus of the inflation expectations' question as predictors showed no significant relationship between selecting each of these topics and inflation expectations ( $p > .10$ ), perhaps due to their lower variability. The results were, however, in the expected direction.

most high-school educated (vs. more educated), and older. As in previous work (Blanchflower and Coille 2009; Lombardelli and Saleheen 2003), regression analyses suggested these demographic differences in inflation expectations were mostly explained by variations in age and education. The actual inflation experiences of these groups likely does not explain the differences in their inflation expectations (Hobijn et al. 2009; Kokoski 2000; Lombardelli and Saleheen 2003; McGranahan and Paulson 2006).<sup>6</sup> Previous research has done little to address the psychological underpinnings to account for these demographic differences.

We found support for three hypotheses as to why members of these demographic groups reported higher inflation expectations. As expected, inflation expectations were higher among individuals who thought relatively more about how to cover expenses and about specific prices when forming their inflation expectations and among individuals with lower levels of financial literacy. Similar relationships were observed whether the dependent variable reflected actual reported inflation expectations or a binary measure of whether inflation expectations were seemingly high, defined as greater than 5%. The expected relationship between shorter financial planning horizons and higher inflation expectations was found only for the binary measure of inflation expectations. Regression analyses controlling for multiple demographic predictors (reported in Table 5) showed independent contributions of each hypothesized relationship to reported inflation expectations, explaining previously reported demographic differences in inflation expectations.

In short, individuals who expect higher inflation may be thinking about different issues when forming their inflation expectations. Especially for respondents with lower levels of income and education, questions about inflation may trigger relatively stronger concerns about their personal financial experiences, relative to the US inflation rate. Because large price changes tend to be more salient than smaller ones, and increasing prices tend to be more salient than decreasing ones (Brachinger 2008; Fluch and Stix 2005; Jungermann et al. 2007), focusing on these issues would be expected to bias inflation expectations upward.

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6. In a later study, some respondents ( $n = 261$ ) indicated for seven items (including housing, food and transportation) whether they were in the top three items on which they spent money, as well as the percent of their yearly budget spent for each item in the top three. Adding a fourth model to the regression including whether each of the seven items were in the spending top three, or including the percent spent on the most common items reported by 160 respondents, did not improve reported predictions of inflation expectations (left panel, Table 5) or whether respondents expected inflation to be greater than 5% (right panel, Table 5) ( $p > .10$ ).

The additional contribution of financial literacy to higher inflation expectations might reflect the increased difficulty individuals with lower literacy have in forming such expectations. These individuals may be more uncertain, resulting in more volatile estimates of inflation over time (VanderKlaauw et al. 2008). Because inflation expectations appear to be bounded at 0% (Curtin 2006), increased volatility should produce higher estimates. Although we did not have the data to examine volatility in individuals' expectations over time, we did find more variable inflation expectations *between* respondents with lower financial literacy, which, among other things, may be explained by higher individual-level uncertainty.

Our data were collected at a time of relatively low inflation, when demographic differences in inflation expectations tend to be less strong (VanderKlaauw et al. 2008). Nonetheless, we replicated all but one of the demographic differences observed in previous studies (Bryan and Venkatu 2001a, 2001b; Jonung 1981). Although the trend was in the same direction as in other studies, we did not find significantly higher inflation expectations for women than for men.

We suspect that the relationships we found were inflated by the question used to measure respondents' inflation expectations, which asked about expected "prices in general." The present study followed the standard question wording used on the well-respected Michigan Survey of Consumers. Our recent research has suggested that asking for expectations for the "rate of inflation" may be less likely to evoke biased thoughts of increasing prices (Bruine de Bruin et al. 2008).

Our results do not indicate whether the seemingly unrealistic inflation expectations reported by people with low financial literacy will affect their financial decisions. However, they do suggest that people with low financial literacy also have less confidence in their financial knowledge and shorter financial planning horizons (Table 4). Although these variables showed no significant relationship to their inflation expectations *per se*, they may affect related financial decisions. That is, having less financial confidence may make individuals feel they do not have the ability to make complicated financial decisions, such as those that extend into the future. Combined with their already shorter financial planning horizons, the result may be the avoidance of long-term financial planning. If so, individuals with low financial literacy may benefit from validated programs targeting their financial literacy and understanding of inflation (Fox, Bartholomae, and Lee 2005).

Indeed, financial literacy may affect retirement planning (Lusardi and Mitchell 2007, 2008), stock market participation (van Rooij, Lusardi,

and Alessie 2007) and portfolio choice (Delavande, Rohwedder, and Willis 2008). It also has been associated with consumer choices (Jae and Delvecchio 2004), hospital choices (Peters et al. 2007) and health plan choices (Greene et al. 2008). Thus, educational interventions targeting financial literacy and understanding of inflation may help to improve financial decisions with outcomes that extend into the future.

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