Expected income growth and the Great Recession

Eric French, Taylor Kelley, and An Qi

Introduction and summary

The Great Recession of 2008–09 was characterized by the most severe year-over-year decline in consumption since 1945. The consumption slump was both deep and long-lived. In this article, we document this decline in aggregate consumption and look at an important determinant of consumption: consumers' expectations about their future income. The analysis uses microeconomic data from the *Michigan Surveys of Consumers* (hereafter, *Michigan Surveys*) to study expected income growth.[1] These data show that consumers' expected income growth declined significantly during the Great Recession. It was the most severe drop in income expectations ever observed in these data, and expectations have not yet fully recovered to pre-recession levels.

The decline is widespread: It exists for all age groups, education levels, and income quintiles. Furthermore, we show that expected income growth is a strong predictor of actual future income and consumption growth. For example, we show that expected income growth has considerable added forecasting power above and beyond lagged consumption and income growth, lagged Treasury bill rates, and lagged stock market returns. For this reason, forecasts of near-term consumption and income growth based on this series suggest sluggish income and consumption growth over the next year. For example, forecasts based on expected income growth suggest that consumption and income will likely grow about 1 percent next year, whereas forecasts that do not account for expected income growth suggest that consumption and income will likely grow more than 2 percent next year. Given the usefulness of these data for forecasting, these data strongly suggest lackluster consumption and income growth in the year ahead.

Usefulness of consumer expectations data for forecasting

There are at least two reasons why survey data on expected income growth might be useful for predicting future income. First, people might have some advance knowledge of their future economic circumstances that is not available in other data. For example, they may know whether their employer is about to reduce its work force. Second, expected income growth might affect aggregate activity through a

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ISSN 0164-0682

causal channel. Pessimistic expectations about future income reduce current aggregate demand and thus firms' demand for workers, actually *causing* a reduction in labor income. In this sense, pessimistic income expectations may create a self-fulfilling prophesy.[2]

Carroll, Fuhrer, and Wilcox (1994) study why consumer expectations might be useful for explaining consumption growth. As they point out, the simplest version of the permanent income hypothesis, the benchmark model in consumption theory, suggests that consumer expectations should not be useful for forecasting consumption growth. The reason for this is that the permanent income hypothesis says that consumption should be proportional to one's assets plus the present discounted value of all expected labor income. High expected consumption growth should be reflected in the current level of consumption. Consumption should change over time only because of asset price changes or changes in the present discounted value of future labor income.[3] Under certain departures from the partial equilibrium permanent income hypothesis, future income expectations may also affect the subsequent *growth rate* of consumption. These departures include slow adjustment due to habit formation; nonseparability between nondurable consumption and the consumption of durables in the presence of adjustment costs; and the presence of rule-of-thumb consumers (i.e., consumers who spend a fixed percentage of their income), and/or liquidity-constrained consumers who respond to income when it arrives, not when it becomes expected. In a general equilibrium sense, income expectations are also determinants of the growth rate of consumption in the extension of the permanent income hypothesis to the case of variable interest rates (see, for example, Hall, 1988), in which case consumption growth depends on the real interest rate, which in turn depends on expected future income relative to the present level. This paper does not identify the reasons why expectation data help forecast future income and consumption. It simply shows that they do.

Some previous studies have argued that data from the *Michigan Surveys* are not very helpful for forecasting consumption (for example, Leeper, 1992, and Ludvigson, 2004) beyond other commonly used variables. For example, Ludvigson (2004) shows that once the econometrician accounts for other variables—such as lagged consumption and income growth, lagged Treasury bill rates, and lagged stock market returns—the Index of Consumer Expectations and the Index of Consumer Sentiment (both indexes created using variables from the *Michigan Surveys*) have little added forecasting power. We find that the Index of Consumer Expectations and the Index of Consumer Sentiment have modest added forecasting power, and expected income growth has greater forecasting power, for consumption after accounting for these other variables.

Consumer spending and the Great Recession

Figure 1 displays the level of real personal consumption expenditures (PCE) from 1962 to 2012:Q4. Even over this long horizon, the figure shows a distinct flattening out of the consumption growth rate in 2008–09. The fact that this pattern is clearly visible even with the perspective of a 50-year window highlights the severity and persistence of the Great Recession and the very slow recovery that has ensued. It took almost 12 quarters for total real PCE to go back to its level at the previous peak in 2007:Q4.

Figure 2 compares the time path of real PCE over several recessionary time periods. For each recession, the level of PCE is normalized to 1 at the peak, as defined by the National Bureau of Economic Research (NBER), prior to the recession. The NBER dates for the recession peaks are 1973:Q4, 1980:Q1, 1981:Q3, 1990:Q3, 2001:Q1, and 2007:Q4.

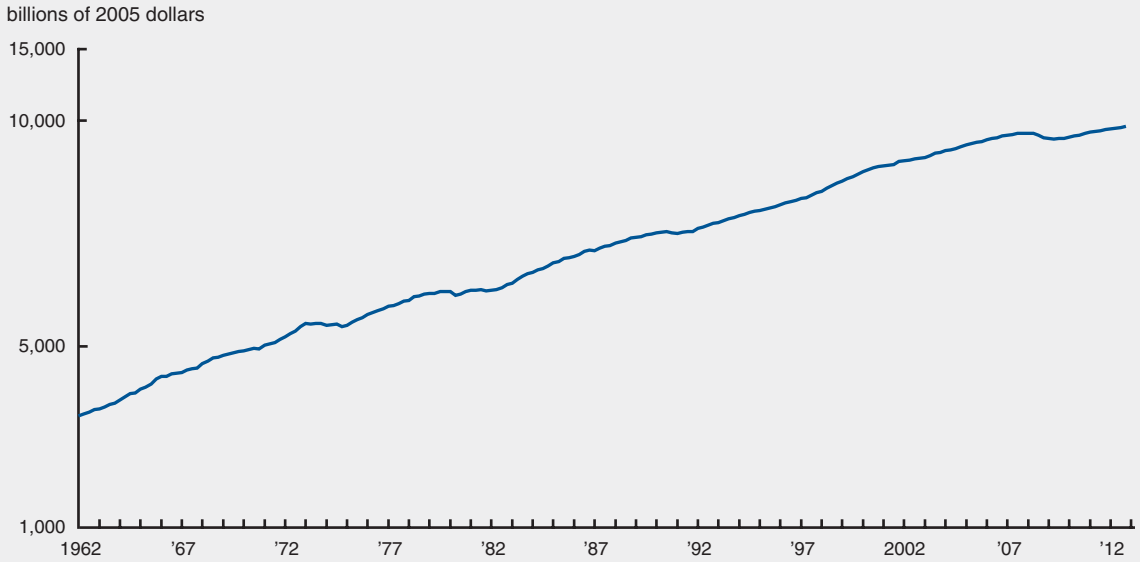
Figure 2 highlights that in the 2008–09 recession, consumption dropped 3.1 percent and was slow to recover afterward. This pattern contrasts with every recession since 1974. During all previous recessionary periods, either consumption fell only modestly or it increased following the peak. In this article, we consider consumer expectations as a possible explanation for why the recovery in consumption was so anemic.

Expected income in the *Michigan Surveys of Consumers*

We use data from the *Michigan Surveys* database, which is a nationally representative probability sample of households. While the surveys began in 1946, their current monthly format began in 1978. Since the mid-1980s, about 500 households have been interviewed per month. Those interviewed are asked a large number of questions about their own current economic conditions and expectations of the future. Responses in these surveys are used to construct the Index of Consumer Sentiment and the Index of Consumer Expectations, both of which are widely followed in both the business and financial communities. These indexes have also been the subject of some academic research.[4] The questions underlying these surveys are designed to capture the public's confidence in the economy and are thus thought to be leading indicators of the economy. An attractive aspect of these variables is that they are publicly available and are released very quickly after the survey is conducted.

FIGURE 1

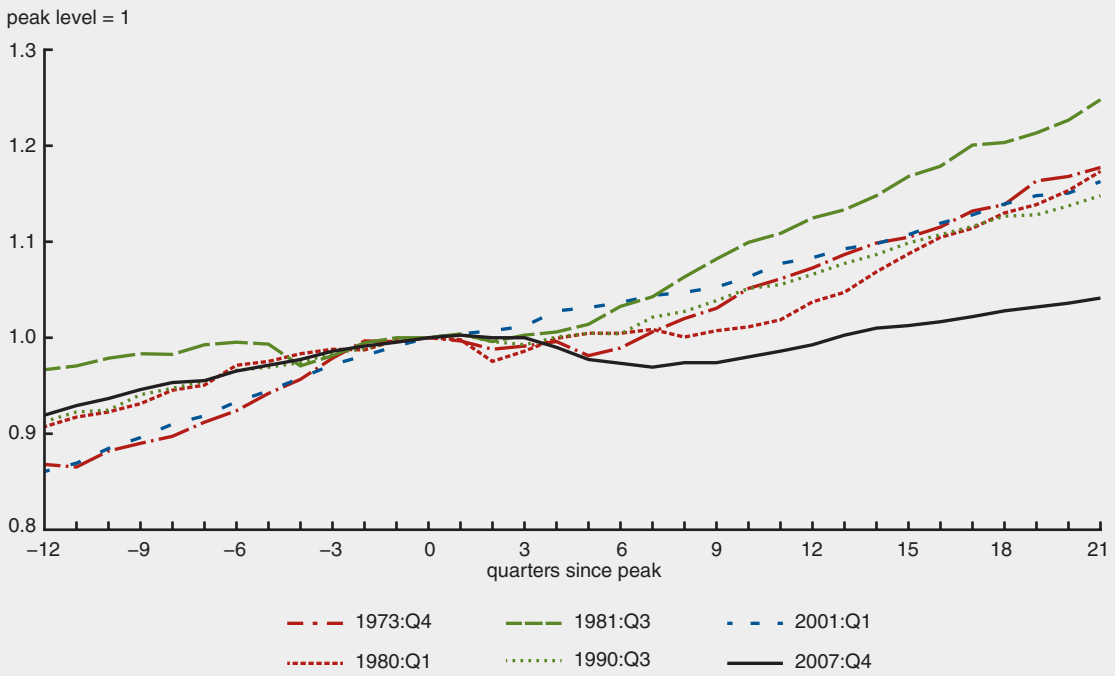
Historical level of real personal consumption expenditures



Note: Personal consumption expenditures (PCE) in log scale; 2005 dollars in billions.
Source: Haver Analytics.

FIGURE 2

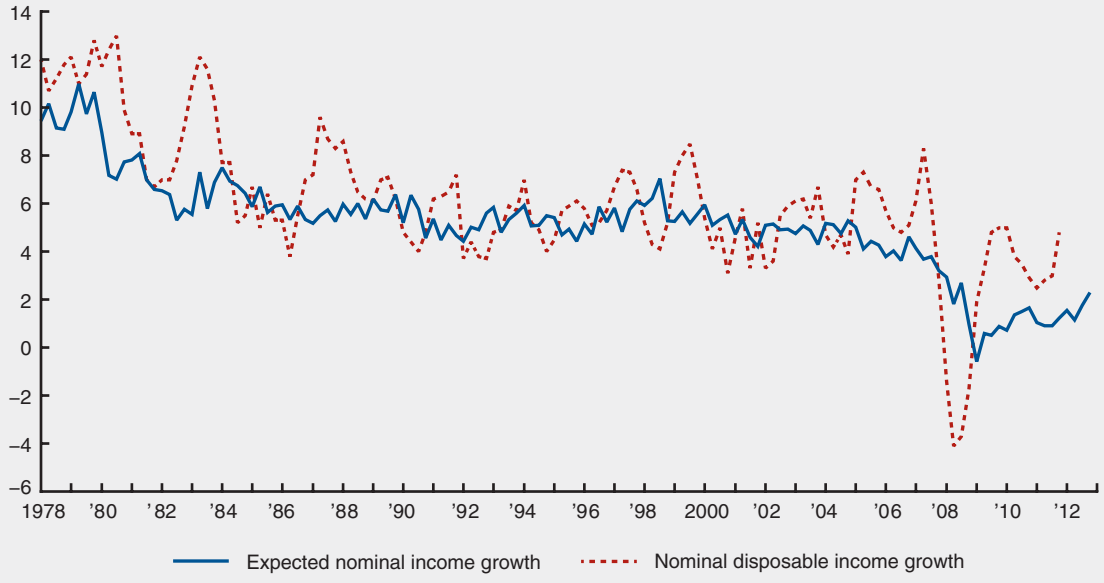
Normalized level of real personal consumption expenditures (2005 dollars, in billions)



Note: For each recession, the level of personal consumption expenditures (PCE) is normalized to 1 at the business cycle peak (as defined by the National Bureau of Economic Research) prior to the recession.
Sources: Authors' calculations based on data from Haver Analytics.

FIGURE 3

Realized and expected nominal annual disposable income growth



Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

In this article, we generate a measure of expected income growth using the microdata from the *Michigan Surveys* database. To the best of our knowledge, only De Nardi, French, and Benson (2012) have used this measure in published research. The *Michigan Surveys* ask two questions to identify consumers' expected income growth.

1) "During the next 12 months, do you expect your income to be higher or lower than during the past year?"

2) "By about what percent do you expect your income to (increase/decrease) during the next 12 months?"

The resulting index of expected income growth ranges between +95 and –95 and reflects the expected percentage change in nominal income in the next year. Given the phrasing of the question, it is not clear if it refers to labor income or total income. We assume that it refers to disposable income, which is total income from all sources minus taxes. Figure 3 compares realized and expected nominal disposable income and shows that the two series track each other well, although nominal disposable income is more volatile. For example, consumers' expected income growth started its decline in 2007, well before the fall in disposable income.

The surveys also ask about expected changes in the price level over the next 12 months. This number is historically very similar to realized Consumer Price Index (CPI) inflation. These two inflation series have diverged in the past, but since the late 1970s the differences between them have been minor. At the start of the Great Recession, however, a large gap opened up, which makes for the largest discrepancy between these two data series. In the second quarter of 2008, expected inflation was reported at +6 percent, compared with –1 percent actual CPI inflation. The two measures have since moved closer together (see figure 4). Clearly, the gap in these two measures affects measured real income growth expectations, as we document in the next section.

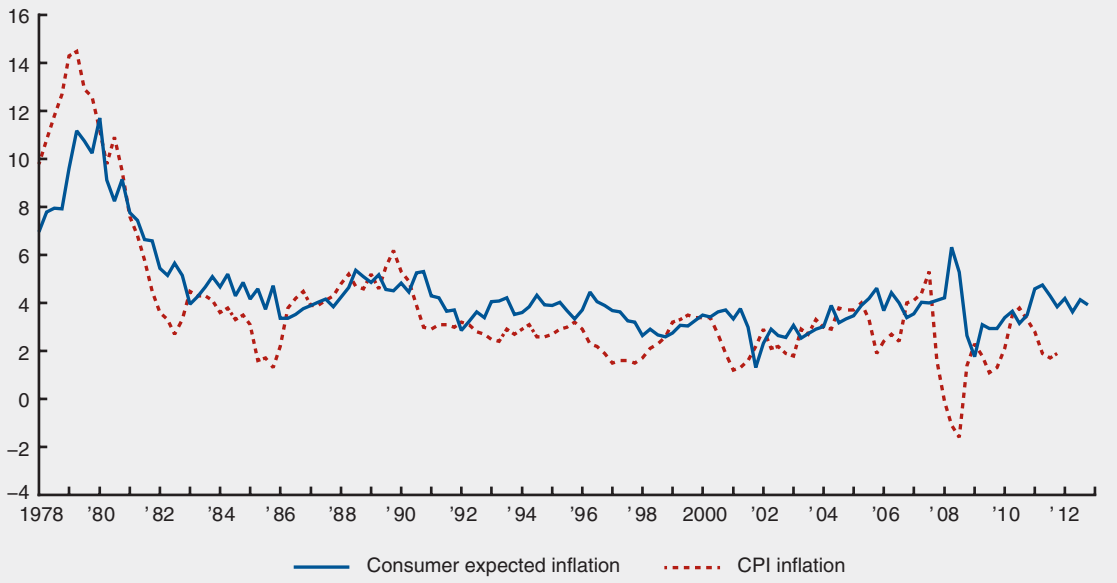
Income growth expectations

Figure 5 shows nominal expected income growth around different recessions. The time period "0" represents the NBER peak of economic activity, "–4" represents expected income growth four quarters before the peak, and "4" represents expected income growth four quarters after the peak. The figure shows that expected income growth was much lower around the Great Recession than around previous recessions.

Nominal income growth during the Great Recession was low, but inflation was also low. To study the behavior of real income expectations, we must measure inflation expectations, which we do in two ways. First, we use actual CPI inflation over the 12-month period

FIGURE 4

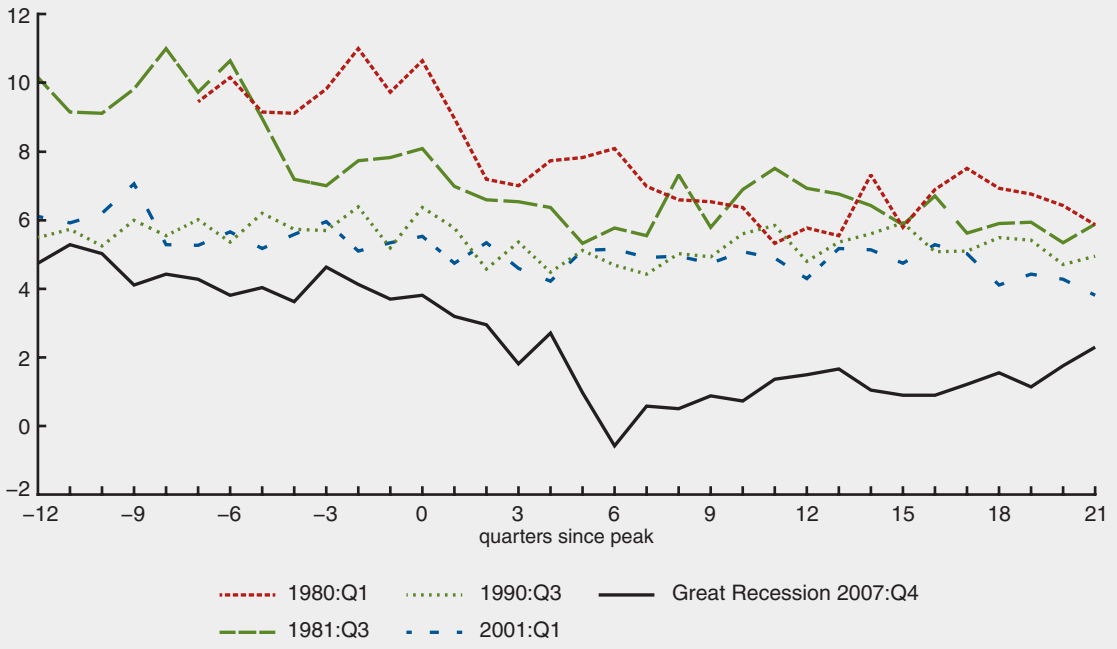
Consumer Price Index versus personal inflation expectations



Note: Time series of 12 months forward inflation since 1978, comparing Consumer Price Index (CPI) with personal inflation expectations from the *Thomson Reuters/University of Michigan Surveys of Consumers*.
Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

FIGURE 5

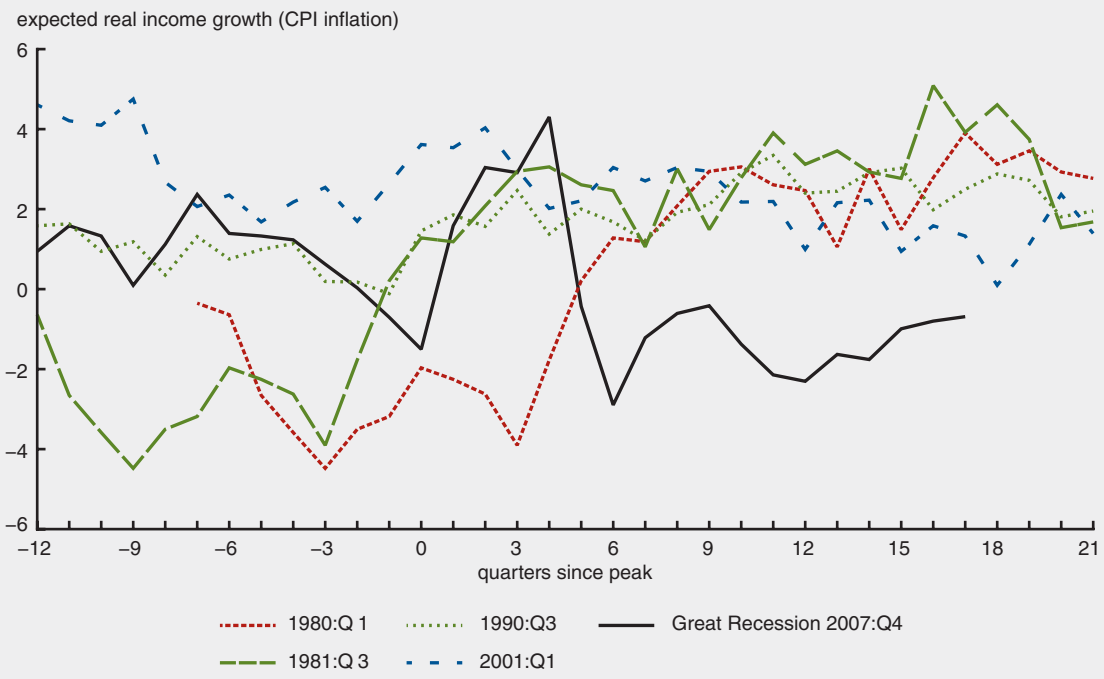
Average expected nominal income growth around recessions



Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

FIGURE 6

Expected real income growth, based on Consumer Price Index inflation



Note: CPI indicates Consumer Price Index.
Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

covered by the survey question, which assumes that consumers have perfect foresight for next year's inflation. Second, we use the answer to the survey question about the individual's expectations about growth in prices over the next 12 months. Using these two measures, we construct individual-level expected real income growth and then aggregate up to population means by quarter. We construct expected real income growth by subtracting each individual's inflation expectations from his expected nominal income growth. The data begin in 1978 and go through 2012:Q4.

In figure 6, there is no clear cyclical pattern prior to the Great Recession in real income expectations when deflating by CPI inflation. Before the most recent recession, real income growth was rather flat; several quarters before the peak, it dropped into negative territory; and four quarters after the peak, it went up to about 4 percent. After that point, however, it recorded a large drop, reaching –3 percent five quarters after the peak. In summary, for the most recent recession, real income growth expectations deflated by CPI show a deterioration and lower average growth than during previous recessions.

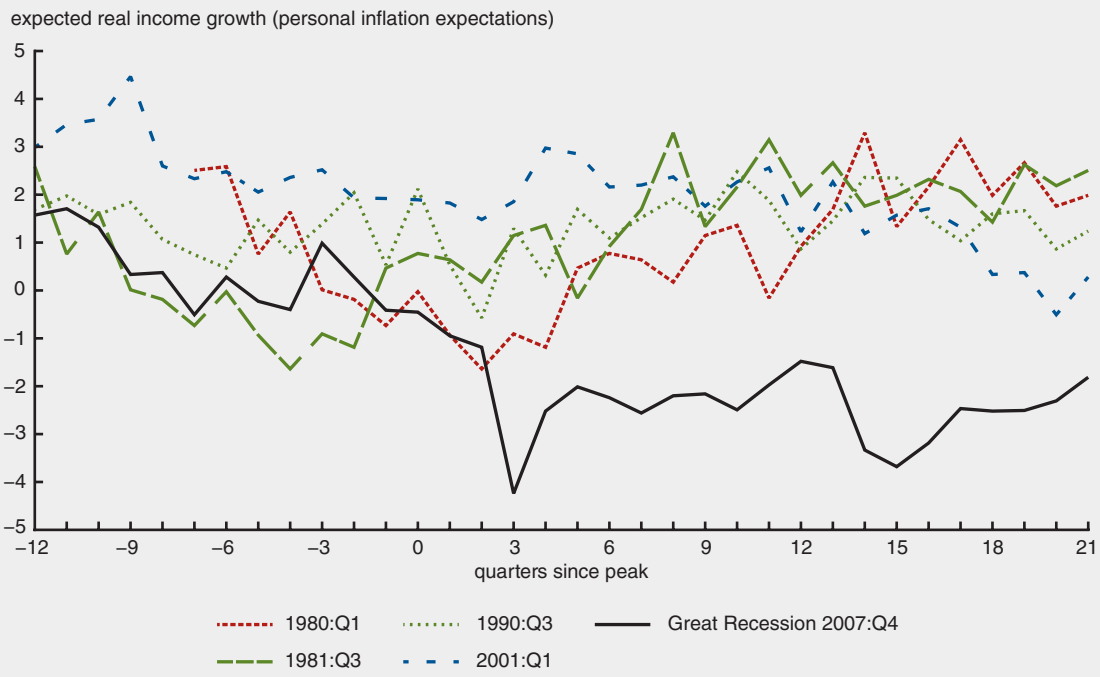
Figure 7 shows that consumers' perceived real income growth using consumers' inflation expectations provides an even more pessimistic outlook about purchasing power during the Great Recession. Consumers' perceived real income growth was dipping in and out of negative territory well before the recession started; and it sustained a large drop starting four quarters before the peak. This drop was abnormal, both in terms of size and duration. The recovery in expected income growth also stands out historically, in terms of its length and sluggishness. Even 21 quarters from the peak, expected income growth is still well below its pre-recession levels.

An attractive feature of the Michigan data is that they allow us to examine responses by age, education, and income. Figure 8 shows that after the late 1970s, younger individuals began to expect higher income growth than their older counterparts around all recessions. All age groups expect roughly equal declines in income during recessions. Relative to previous recessions, all age groups expected greater declines in income during the Great Recession.

Figure 9 shows that around all previous recessions, people with higher levels of education (some college and above) have expected faster income growth than people with lower levels of education (high school and

FIGURE 7

Expected real income growth, based on consumers' inflation expectations



Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

below). It also shows that during the Great Recession, the college educated were more pessimistic relative to previous recessions. Although the college educated still expect faster income growth than the less educated, the differences are less stark than in the past. This is consistent with Petev, Pistaferri, and Eksten's (2010) findings. First, they find that increased government transfers supported income among the poorest-income households during the Great Recession.[5] Second, using the *Consumer Expenditure Survey*, they find that survey respondents in the top decile of the wealth distribution (who are mostly college educated) are the ones who decreased spending the most during the Great Recession (which is also consistent with the findings of Meyer and Sullivan, 2013). This finding also holds for the subcategories of nondurables and services. This drop in consumption might be due to the large negative wealth effect experienced by these households as a result of the decrease in house values and stock market valuation.

Figure 10 shows that the Great Recession reduced the expected income growth of all income quintiles.

Our main findings from the analysis of the micro-data are as follows. First, expected nominal income growth declined significantly during the Great Recession. It is the worst drop ever observed in these data, and it has not yet recovered to pre-recession levels. Second, expectations for real income growth have also declined, and the decline in expected real income growth is more severe when personal inflation expectations are used instead of actual CPI inflation. Third, the decline exists for all age groups, education levels, and income quintiles. Relative to previous recessions, the latest recession found those with higher levels of income and education feeling more pessimistic about their prospects than their poorer and less-educated counterparts.

Do the *Michigan Surveys* have predictive power for future income and consumption growth?

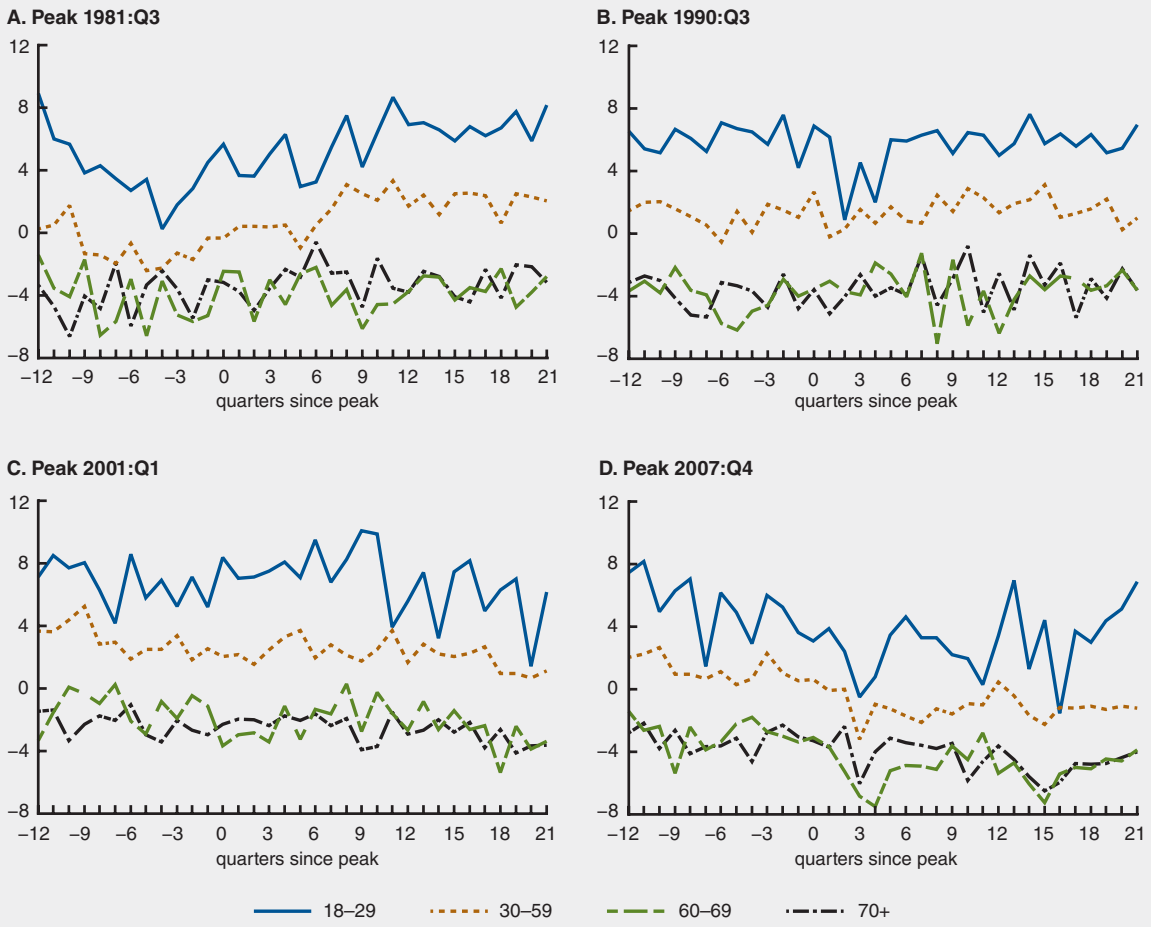
Next, we explore the predictive power of the *Michigan Surveys* data for future disposable income and consumption growth.[6] We estimate the regression for disposable income first:

$$\left(\frac{Y_{t+k+4}-Y_{t+k}}{Y_{t+k}}\right)=\alpha_0+\alpha_1\left(\frac{Y_t-Y_{t-4}}{Y_{t-4}}\right)+\alpha_2 g_{Mt}+\varepsilon_{t+k},$$

where α_0, α_1, α_2 are parameters to estimate and α_1

FIGURE 8

Expected real income growth, by age group



Note: Expected real income growth is calculated using consumers' inflation expectations from the *Thomson Reuters/University of Michigan Surveys of Consumers*.
Source: Authors' calculations based on data from *Thomson Reuters/University of Michigan Surveys of Consumers*.

and α_2 are reported in table 1. The variable

$$\left(\frac{Y_{t+k+4} - Y_{t+k}}{Y_{t+k}}\right)$$

is next year's annual income growth k quarters from now, so k is 0 when forecasting income growth over the next year and 4 when forecasting income growth over the subsequent year. The variable

$$\left(\frac{Y_t - Y_{t-4}}{Y_{t-4}}\right)$$

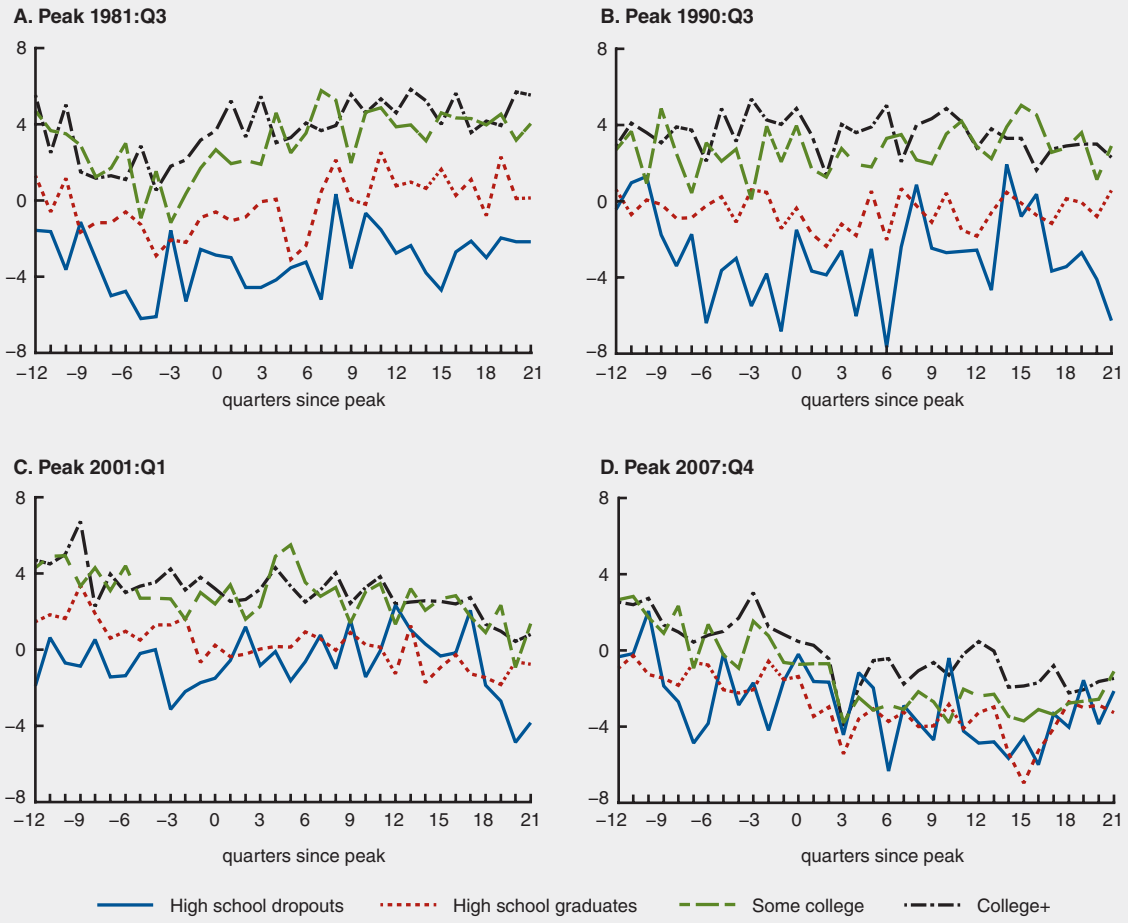
is income growth over the past year, and g_{Mt} is expected real income growth deflated using expected inflation, both from the *Michigan Surveys*. As our results show, deflating by expected inflation produces the most accurate forecasts of future income and consumption growth.

As shown in table 1, lagged actual income growth has a negative coefficient, while expected income growth has a positive coefficient. For income growth over the next year, the coefficient on expected income growth is 0.74, indicating that a 1 percent decline in expected income growth reduces next year's income growth 0.74 percent, controlling for the past year's income growth. The third column shows that predicted income growth over the next year (2012:Q4 to 2013:Q4), using lagged income growth and expected income growth, is 0.5 percent, well below its average of 2.8 percent over the 1978–2012 sample period. Income growth between 2013:Q4 and 2014:Q4 is also forecasted to be low.

Expected income growth is also a good predictor of consumption growth. Table 1 also presents regressions using future consumption growth as the left-hand-side

FIGURE 9

Expected real income growth by education level



Note: Expected real income growth is calculated using consumers' inflation expectations from the *Thomson Reuters/University of Michigan Surveys of Consumers*.
Source: Authors' calculations based on data from *Thomson Reuters/University of Michigan Surveys of Consumers*.

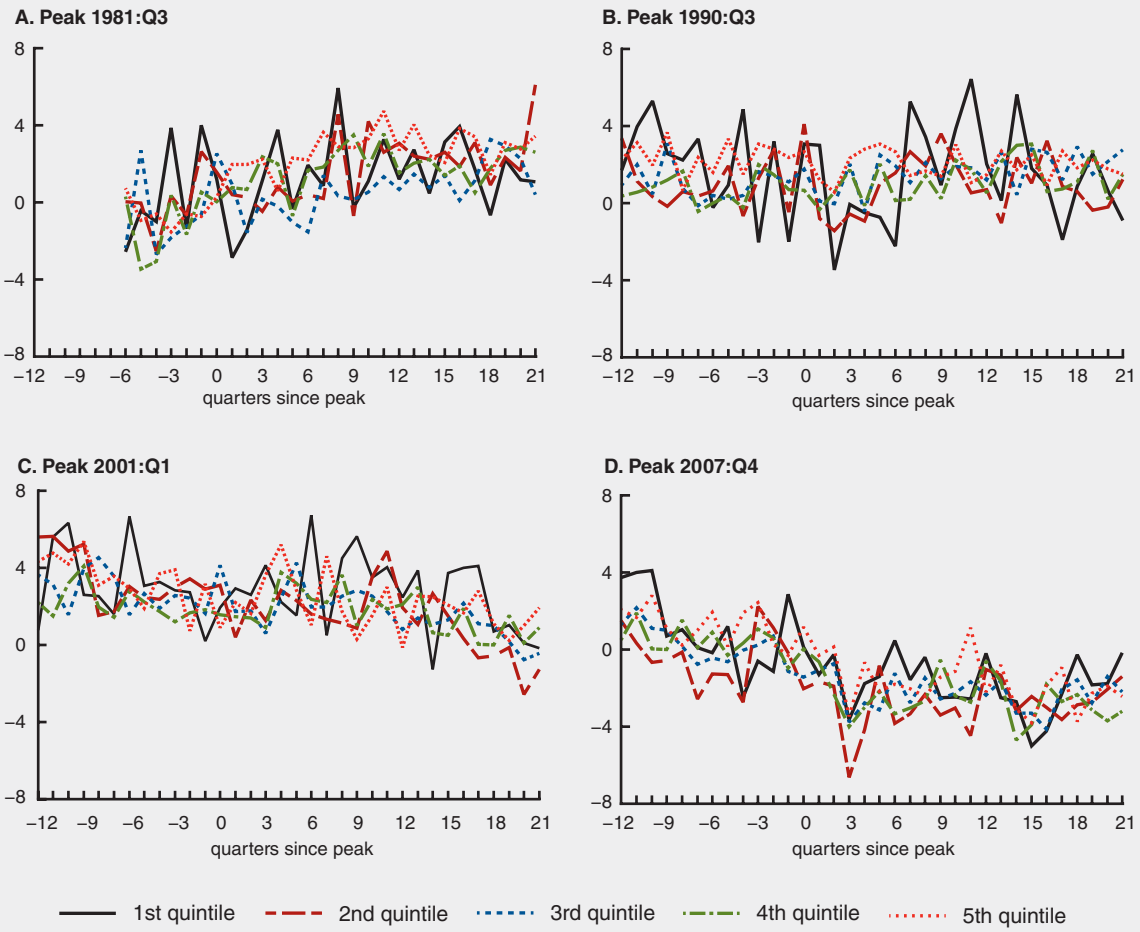
variable and lagged income growth and the Michigan expectations variable as the right-hand-side variables. The consumption forecast for 2012:Q4 to 2013:Q4 is for 0.9 percent growth.

Table 2 shows forecasts of alternative measures of consumer expectations. In this table, we focus on the predictive power of different measures of consumer expectations for forecasting consumption growth one year ahead. Table 1 showed that our benchmark expectations measure is not particularly good for forecasting beyond one year, as measured by the R-squared statistic. Furthermore, the consumer expectations variables that predict consumption well also predict income well. Thus, for brevity, we do not report the results for income and just focus on consumption.

The first row of table 2 shows results for consumption growth using the benchmark expectations measure that we also used in table 1. The second row deflates expected income growth by CPI inflation over the past year. This measure produces a consumption forecast of 2.5 percent growth for the four quarters ending in 2013:Q4. This higher forecast is not surprising given that, when deflating by CPI (as in figure 6) rather than expected inflation (as in figure 7), expected income growth over the next year is much stronger. However, the R-squared statistic shows that deflating by lagged CPI inflation yields a lower R-squared, meaning that it is somewhat less useful for predicting future consumption growth. For this reason, we prefer deflating by consumers' expected inflation.

FIGURE 10

Expected nominal income growth by income quintile



Note: Expected real income growth is calculated using consumers' inflation expectations from the *Thomson Reuters/University of Michigan Surveys of Consumers*.
Source: Authors' calculations based on data from *Thomson Reuters/University of Michigan Surveys of Consumers*.

In the third row, we take median expected nominal income growth minus median expected inflation. This measure has the attractive feature that these data are publicly available. Using this measure produces a forecast of 1.4 percent, modestly higher than our benchmark estimate. However, the R-squared statistic suggests that this model fits the data worse than the benchmark model.

The fourth row takes the median of real (that is, deflated using inflation expectations) expected income growth as the expected income growth measure. The forecast from this model is similar to the benchmark specification and fits the data about as well as the benchmark.

The next three rows use measures of consumer confidence from the same survey. Row 5 uses the log of the Index of Consumer Expectations. Row 6 uses the Index of Consumer Sentiment. Row 7 uses the change in the log of consumer expectations. Row 8 uses the log of one of the subcomponents of the Index of Consumer Expectations, the measure of whether the next five years will be good economic times.[7] All of the consumer expectations and consumer sentiment measures suggest relatively stronger consumption growth ahead than is suggested by the expected income growth measures. However, these measures have less predictive power than the expected income growth measure.

Row 9 shows that lagged income growth has modest predictive power for consumption growth, and row 10 shows that expected income growth alone has very good predictive power.

TABLE 1

Income and consumption growth regression results

Dependent variable	Lagged income growth variable	*Michigan Surveys* income expectations	Forecasted annual growth (%), Q4/Q4	R-squared
Annual income growth				
One year ahead	−0.35	0.74	0.51	
	(0.08)	(0.17)	(2012:Q4 to 2013:Q4)	0.30
Two years ahead	0.03	0.36	1.70	
	(0.09)	(0.14)	(2013:Q4 to 2014:Q4)	0.10
Three years ahead	−0.27	0.47	1.28	
	(0.15)	(0.21)	(2014:Q4 to 2015:Q4)	0.09
Annual consumption growth				
One year ahead	−0.08	0.71	0.87	
	(0.12)	(0.20)	(2012:Q4 to 2013:Q4)	0.34
Two years ahead	−0.13	0.54	1.26	
	(0.13)	(0.17)	(2013:Q4 to 2014:Q4)	0.14
Three years ahead	−0.21	0.33	1.91	
	(0.13)	(0.22)	(2014:Q4 to 2015:Q4)	0.05

Notes: The regressions were run with data from 1978:Q1 to 2012:Q4. Newey–West standard errors are in parentheses. Average annual income and consumption growth are 2.78 percent and 2.91 percent, respectively.
Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

TABLE 2

Alternative expectations measures, consumption growth, 2012:Q4 to 2013:Q4

Expectations measures	Lagged income growth variable	*Michigan Surveys* expectations measure	Forecasted annual growth (%), Q4/Q4	R-squared
1) Mean of nominal income growth deflated by inflation expectations	−0.08	0.71	0.87	0.34
	(0.12)	(0.20)		
2) Mean of nominal income growth deflated by lagged CPI inflation	0.05	0.43	2.51	0.29
	(0.08)	(0.12)		
3) Median expected nominal income growth minus median expected inflation[a]	0.03	0.79	1.41	0.31
	(0.09)	(0.21)		
4) Median of expected income growth deflated by inflation expectations[b]	0.03	1.24	0.81	0.34
	(.10)	(0.40)		
5) Log of Index of Consumer Expectations	−0.01	5.43	2.62	0.28
	(0.09)	(1.53)		
6) Log of Index of Consumer Sentiment	0.01	5.49	2.53	0.23
	(0.11)	(2.07)		
7) Change in log of Index of Consumer Expectations	0.29	4.97	3.40	0.13
	(0.10)	(2.39)		
8) Log of expectations five years ahead	0.09	3.15	3.10	0.20
	(0.07)	(1.01)		
9) No expectations measure	0.28		3.00	0.07
	(0.09)			
10) Mean of nominal income growth deflated by inflation expectations, no lagged income variable		0.66	1.04	0.34
		(0.17)		

[a]Takes difference between median of expected income growth and median of expected inflation, quarter by quarter.
[b]Deflates expected income growth by expected inflation for every member of the sample, then takes the median over all members interviewed that quarter.
Notes: The regressions were run with data from 1978:Q1 to 2012:Q4. Newey–West standard errors are in parentheses.
Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

TABLE 3

Annual consumption growth forecasts with alternative expectations and additional quarterly covariates

Expectations measure	Four lags of consumption	Four lags of income	Four lags of S&P 500	Four lags of Treasury bill rate	*Michigan Surveys* expectations measure	R-squared	Adjusted R-squared	Forecast (%), 2012:Q4–2013:Q4
No expectations measure	2.16	−0.19	0.05	−1.09		0.39	0.31	2.18
	(0.01)	(0.67)	(0.06)	(0.01)				
Mean of nominal income growth deflated by inflation expectations	0.99	−0.35	0.08	−0.85	0.46	0.47	0.39	1.30
	(0.45)	(0.70)	(0.01)	(0.16)	(0.02)			
Log of Index of Consumer Expectations	1.55	−0.60	0.05	−0.92	3.15	0.43	0.36	2.30
	(0.12)	(0.73)	(0.17)	(0.02)	(0.03)			
Log of Index of Consumer Sentiment	1.68	−0.54	0.05	−1.01	2.74	0.41	0.32	2.21
	(0.13)	(0.66)	(0.12)	(0.01)	(0.12)			

Notes: The table reports the sum of the coefficients on the quarterly lags of the variable indicated; the probability that the variable can be excluded from the prediction equation appears in parentheses. Hypothesis tests were conducted using a heteroskedasticity and serial correlation robust covariance matrix.

Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

Comparing the R-squared statistics in row 1 and row 10 indicates that virtually all of the forecasting power from lagged income growth and expected income growth combined is coming from expected income growth alone.

When including multiple consumer expectations measures in the same regression, our preferred measure (expected income growth deflated using expected inflation) is still positive and statistically significant. Furthermore, forecasts based on regressions that include our preferred measure always yield a forecast of low consumption growth for next year. For example, when regressing consumption growth on our preferred measure, as well as lagged income growth and the log Index of Consumer Expectations, our forecast for next year's consumption growth is 1.2 percent.

Previous research suggests that consumer expectations are not very helpful for forecasting consumption growth after conditioning on other variables, such as multiple lags of consumption, income, the Treasury bill rate, and stock price growth (for example, Ludvigson 2004). In table 3, we assess whether expected income growth is still useful for forecasting after accounting for these other variables. In order to assess the forecasting power of our measures, we begin by presenting results from a regression of annual consumption growth using four quarterly lags of consumption growth, income growth, the Treasury bill rate, and growth in the S&P 500 stock market index, as well as a single expectations measure. The table reports the sum of the four coefficients (or the one coefficient in the case of the expectations measure) and the *p*-values for the joint marginal significance of the lags of each variable. We report the R-squared statistic and also the adjusted R-squared statistic. The adjusted R-squared statistic penalizes the R-squared statistic for the total number of parameters using in the regression. Since adding parameters mechanically increases the R-squared statistic, even though it might not improve the ability of the model to forecast out of sample, the adjusted R-squared is thought to give a better sense of the model's ability to forecast out of sample.

The top row of table 3 shows that when using no expectations measure, lagged consumption, income, the Treasury bill rate, and the stock market can explain 40 percent of the variance of one-year-ahead consumption growth. Lagged consumption, stock prices, and Treasury bill rates all turn out to be statistically significant. Because of the number of parameters, the adjusted R-squared measure is

TABLE 4

One-year-ahead consumption growth forecasts with alternative expectations, U-statistics, and RMSE

	1992:Q4–2012:Q4		2002:Q4–2012:Q4	
Covariates used	**RMSE**	**U-statistic**	**RMSE**	**U-statistic**
1) Table 3 covariates, no expectations variable	1.78	1.08	2.12	1.11
2) Table 3 covariates and real income expectations	1.81	1.10	2.18	1.14
3) Table 3 covariates and log of Index of Consumer Expectations	1.78	1.09	2.11	1.10
4) Table 3 covariates and log of Index of Consumer Sentiment	1.78	1.08	2.11	1.11
5) Lagged income growth, no expectations variable	1.78	1.09	2.14	1.12
6) Lagged income growth and real income expectations	1.53	0.93	1.93	1.01
7) Lagged income growth and log of Index of Consumer Expectations	1.53	0.93	1.83	0.96
8) Lagged income growth and log of Index of Consumer Sentiment	1.58	0.96	1.90	0.99
9) Real income expectations, no other covariates	1.51	0.92	1.90	0.99

Notes: Table 3 covariates include four quarterly lags of consumption, labor income, S&P 500 index growth, and Treasury rates. Lagged income growth is annual disposable income growth. U-statistic = $\sqrt{\frac{\sum_{t=1}^{T}(\hat{c}_{t+4} - c_{t+4})^2}{\sum_{t=1}^{T}(c_{t+4} - c_t)^2}}$, where $\hat{c}_{t+4}$ is the model's forecast for next year's annual consumption growth using data through time t, c_{t+4} is the realized value for next year's annual consumption growth, and c_t is last year's consumption growth. Root mean squared forecast error (RMSE) = $\sqrt{\frac{1}{T}\sum_{t=1}^{T}(\hat{c}_{t+4} - c_{t+4})^2}$.

Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

somewhat lower though, at 0.32. Forecasted consumption growth from 2012:Q4 to 2013:Q4 is 2.2 percent.

The next row includes our preferred expected income growth measure. When we add this measure, only the stock market measures and expected income growth remain statistically significant. For example, the coefficient on the expectations measure is 0.46 with a *p*-value of 0.02, meaning that if the expectations measure has no predictive power, there is only a 2 percent chance that we would have estimated such a large coefficient in our sample. The adjusted R-squared rises from 0.31 to 0.39, showing again that the measure does improve the fit of the model. Furthermore, the forecast of next year's consumption growth, 1.3 percent, is still very low.

The next two rows use the Index of Consumer Expectations and the Index of Consumer Sentiment. Consistent with Ludvigson (2004), we show that these measures add modest predictive power relative to lagged consumption, income, Treasury bill rates, and stock market performance. The bottom row shows that, relative to the case of no expectations variable, adding the log of the Index of Consumer Sentiment barely increases the adjusted R-squared.

Table 4 provides more evidence of the forecasting power of the expectations variables. It shows the root mean squared forecast error (RMSE) and U-statistic associated with each of the four different forecasting models shown in table 3, plus four of the different forecasting models in table 2.[8] A U-statistic of below 1 suggests that forecasts from the estimated model have a lower RMSE than would result from using a random walk as the forecast of consumption growth.[9] The U-statistic for row 1 shows that over the 1992:Q4–2012:Q4 and 2002:Q4–2012:Q4 periods, the regression model that uses four lags of consumption, income, Treasury bill, and stock market information does worse than just using last year's consumption growth as a forecast. Furthermore, rows 2–4 indicate that adding in any of the expectations measures, if anything, increases the RMSE and the U-statistic. Models with many parameters

TABLE 5

Consumption subcomponents growth regression results

Dependent variable	Lagged income growth variable	Expectations variable	Forecasted annual growth (%), Q4/Q4	R-squared
	Expectations variable is expected real income growth			
Annual consumption growth				
One year ahead	–0.08	0.71***	0.87	0.34
	(0.12)	(0.20)		
Two years ahead	–0.13	0.54***	1.26	0.14
	(0.13)	(0.17)		
Three years ahead	–0.21	0.33	1.91	0.05
	(0.13)	(0.22)		
Annual durables growth				
One year ahead	–0.35	1.47**	0.87	0.12
	(0.44)	(0.73)		
Two years ahead	–0.28	0.68	3.19	0.02
	(0.48)	(0.57)		
Three years ahead	–0.64*	0.19	4.89	0.03
	(0.32)	(0.61)		
Annual nondurables and services growth				
One year ahead	–0.04	0.58***	0.95	0.44
	(0.09)	(0.15)		
Two years ahead	–0.11	0.50***	1.08	0.22
	(0.08)	(0.13)		
Three years ahead	–0.15	0.33*	1.59	0.08
	(0.12)	(0.18)		
	Expectations variable is log of Consumer Expectations Index			
Annual consumption growth				
One year ahead	–0.01	5.43***	2.62	0.28
	(0.09)	(1.53)		
Two years ahead	0.01	2.17	2.78	0.05
	(0.13)	(1.85)		
Three years ahead	–0.10	0.79	2.90	0.01
	(0.13)	(1.62)		
Annual durables growth				
One year ahead	–0.41	14.89***	4.26	0.15
	(0.35)	(5.41)		
Two years ahead	–0.17	4.06	5.00	0.01
	(0.51)	(6.87)		
Three years ahead	–0.63**	1.56	5.36	0.03
	(0.31)	(4.89)		
Annual nondurables and services growth				
One year ahead	0.05	3.78***	2.45	0.29
	(0.07)	(1.26)		
Two years ahead	0.04	1.69	2.51	0.06
	(0.08)	(1.24)		
Three years ahead	–0.03	0.52	2.59	0.00
	(0.12)	(1.29)		

* Significant at the 90 percent level.
** Significant at the 95 percent level.
*** Significant at the 99 percent level.

Notes: See table 1 notes. Expected real income was deflated using consumers' expected inflation. Average annual durables and nondurables plus services growth are 5.1 percent and 2.6 percent, respectively.

Sources: Authors' calculations based on data from Haver Analytics and *Thomson Reuters/University of Michigan Surveys of Consumers*.

frequently have poor out-of-sample performance. Table 4 provides another example of this. Row 5 considers a simple model that uses last year's income growth to predict next year's consumption growth. The U-statistic for this model is also above 1. However, rows 6–8 show that models that use just income growth and consumer expectations measures usually have U-statistics below 1, suggesting that these models are better for forecasting consumption growth than just using last year's consumption growth. Finally, row 9 shows that using only expected income growth performs as well as any of the models we consider, and always seems to perform better than a random walk.

Taken together, tables 2–4 show that real income expectations are useful for forecasting consumption growth, both within sample (as shown using the R-squared statistic) and out of sample (as shown using the U-statistic).

Table 5 decomposes the total consumption growth regression estimates in table 1 into durables and nondurables. Table 5 shows that a 1 percent increase in expected income growth increases next year's durables spending by 1.47 percent and nondurables and services spending by 0.58 percent.[10] Despite the larger coefficient on durables, the R-squared statistic shows that we are less able to predict the variability in durables spending than in nondurables and services spending. Lagged income and expected income growth can jointly explain 44 percent in the variability in nondurables and services spending growth but only 12 percent of the variability of durables spending growth. Table 5 shows that the two measures have virtually no predictive power for durables spending growth beyond one year, although the measures have some predictive power for nondurables and services spending growth. Table 5 also shows that expected income growth is much more useful for forecasting nondurables and services spending growth than the Index of Consumer Expectations, at least as measured by the R-squared statistic.

In short, the low expected income growth in the *Michigan Surveys* data suggests that the U.S. will experience low income and consumption growth over the next two years.

Conclusion

This article documents the decline in aggregate consumption during and after the Great Recession. It also explores the relationship between the decline in consumption and the decline in consumers' expectations about their future income. The analysis uses microeconomic data from the *Michigan Surveys of Consumers* to study expected income growth. These data show that expected income growth declined significantly during the Great Recession for all age, income, and education groups. It is the worst drop ever observed in these data, and it has not yet fully recovered to prerecession levels. Furthermore, we show that expected income growth is a strong predictor of actual future income and consumption growth. For this reason, forecasts of near-term consumption and income growth using these data suggest sluggish income and consumption growth over the next year.

Policymakers are still debating which actions, if any, should be taken to stimulate the economy. Although this article does not give any clear direction on the path that should be taken, the results discussed here suggest that actions undertaken to stimulate the economy are unlikely to lead to an overheated, high-inflation economy in the near future.

NOTES

[1]The official name is the *Thomson Reuters/University of Michigan Surveys of Consumers*; see http://thomsonreuters.com/products_services/financial/financial_products/a-z/umichigan_surveys_of_consumers/.

[2]Barsky and Sims (2009) suggest that the main reason questions in the *Michigan Surveys* are useful for predicting future income growth is that individuals have some information about their future financial circumstances, not that their optimism causes fluctuations in future output.

[3]The simple partial equilibrium permanent income hypothesis implies that, conditional on initial assets, consumption is roughly proportional to the capitalized value of expected future labor income. Denoting c_t as consumption at time t, r as the interest rate, W_t as assets at time t, Y_{t+i} as nonasset income at time $t + i$, β as a variable that accounts for an individual's discounting of the future, and E_t as an individual's expectations of future variables, Flavin (1981) shows that $c_t = \beta[rW_t + (r/1(1+r))E_t\sum_{i=0}^{\infty}(1+r)^{-1}Y_{t+i}]$. Dividing both sides by current income y_t and log-linearizing, we see that the log consumption/income ratio is (approximately) a present value of all future expected income growth rates. Thus, in this benchmark theory, expected future income matters because (conditional on current income) it is the key determinant of the current level of consumption.

[4]Examples include Leeper (1992), Carroll, Fuhrer, and Wilcox (1994), Souleles (2004), Ludvigson (2004), and Barsky and Sims (2009).

[5]As a possible explanation for the pessimism of the wealthy, Shapiro (2010) finds that these households were exposed more to the stock market and experienced larger declines in wealth as a consequence. The median decline in wealth was 15 percent in Shapiro's data, and those who lost at least 10 percent of their net worth had almost twice the mean wealth and 3.5 times the median wealth of the sample.

[6]See Leeper (1992), Carroll, Fuhrer, and Wilcox (1994), Souleles (2004), Ludvigson (2004), Barsky and Sims (2009), and De Nardi, French, and Benson (2012) for more on the predictive power of the *Michigan Surveys*.

[7]It uses the response to "Looking ahead, which would you say is more likely—that in the country as a whole we'll have continuous good times during the next five years or so, or that we will have periods of widespread unemployment or depression, or what?"

[8]The RMSE for the 1992:Q4–2012:Q4 period is calculated by first estimating the regression model using data up to 1991:Q4. Next, we use the estimated coefficients to forecast consumption growth over the 1991:Q4–1992:Q4 period. We then subtract from this realized consumption growth over the 1991:Q4–1992:Q4 period and square the value. We repeat this for 1992:Q1–1993:Q1, …, 2011:Q4–2012:Q4. We then take the square root of the mean of the squared errors over the forecasting period, which is our measure of RMSE. The U-statistic divides RMSE by the RMSE of a model that uses last year's consumption growth as a forecast of this year's consumption growth.

[9]The random walk forecast uses last year's consumption growth as a forecast of this year's consumption growth.

[10]We also tried regressing nondurables and services spending growth on expected income growth separately. The estimates for both subcomponents were very similar to each other so we do not report them. For example, the coefficient on expected income growth is 0.62 in the one-year-ahead nondurables equation and 0.57 in the one-year-ahead services equation (when focusing on growth over the next year), versus 0.58 for nondurables and services together.

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