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Is the Anchoring of Consumers' Inflation Expectations Shaped by Inflational Experience?

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Abstract

In this paper, we explore the degree of anchoring of consumers' individual long-run inflation expectations utilizing the University of Michigan Survey of Consumer's rotating panel micro-structure. Our results indicate that long-run inflation expectations became more anchored over the last decades, as the degree of co-movement between short- and long-run expectations fell significantly. While we observe that the anchoring of expectations increases for all age and birth cohorts, it seems that older cohorts, who experienced the high inflation period of the 1970s, remain less anchored in their long-run inflation expectations as compared to the young cohorts. Older cohorts show a higher volatility in their degree of anchoring and react more to adverse news shocks. This alludes to potentially long-lasting costs of high inflation spells.

JEL-Codes: E310, E520, E580, D840, C250.

Keywords: anchoring, inflation expectations, micro data, birth cohort effects, news.

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1 Introduction

To anchor inflation expectations around an implicit or explicit inflation target is one of the most important tasks of monetary policy aiming to stabilize inflation (Bernanke, 2007). Well-anchored expectations enable inflation-targeting central banks to achieve greater stability of output and employment in the short run, while ensuring price stability in the long run (Orphanides and Williams, 2007). Consequently, central banks monitor inflation expectations very closely and try to improve the anchoring.

The financial crisis, the following ultra-expansionary monetary policy as well as the recent debate about increasing the inflation target to 4% have raised concerns about the firm anchoring of expectations.[1] In light of this discussion, the question might not only be what are the direct consequences in terms of current inflation and expectations, but also whether regime changes or high inflation spells might have longer term consequences on inflation expectations that are driven by experience. More specifically, will a cohort that experienced a high inflation spell have the same degree of anchoring under an inflation-targeting monetary policy as a cohort that experienced stable inflation rates only? Hence, in this paper we not only look at how the anchoring of consumers' inflation expectations has evolved over time, but evaluate the relevance of experience as well.

The idea that the anchoring of inflation expectations could be shaped by inflation experience is related to the models of learning by experience by Malmendier and Nagel (2011, 2016). The authors show that under the assumption that agents only use data experienced during their lifetimes in their learning algorithm, persistent differences between birth and age cohorts arise. While they apply the concept to consumer's participation in stock markets and their level of inflation expectations, to the best of our knowledge we are the first to test for implications for the anchoring of inflation expectations in this context.

The idea of relating the anchoring of long-run inflation expectations of consumers to their inflation experience is also inspired by the analysis in Ehrmann and Tzamourani (2012). Using individual survey responses from a large sample of industrialized countries between 1981-2000, the authors show that the likelihood of attaching a high importance to policies that fight inflation is related to individual inflation experience. The results suggest that while memories of hyperinflation shape a consumer's attitude in a long-lasting manner, memories of lower inflation rates tend to fade after about ten years.

To measure the degree of anchoring, we focus on the co-movement between short- and long-run inflation expectations. The basic idea is that, if inflation expectations are firmly anchored, a transitory shock may influence short-run expectations, but should not affect long-run expectations. Consequently, a transmission of the shock from short- to long-run expectations would be judged unfavorably. Note that this measure of anchoring can be motivated by different theoretical models. Models with information rigidities, e.g.

[1] See, for instance, the discussion between Blanchard et al. (2010) vs. Bernanke (2010).

Sims (2003), Mankiw and Reis (2002), Coibion and Gorodnichenko (2015), as well as models with parameter uncertainty and learning, e.g. Orphanides and Williams (2004, 2007); Malmendier and Nagel (2011, 2016), predict that short- and long-run expectations co-move, that long-run expectations move less than short-run expectations and that the degree of co-movement depends on the monetary policy stance. Recently, the model by Carvalho et al. (2017) proposes a definition of anchored long-run inflation expectations based on their insensitivity to short-run inflation fluctuations caused by transient shocks, which is very close to the empirical definition used in our paper. Using a state-dependent learning algorithm, their model seems to be able to capture the dynamics of survey expectations in the US quite well.

Most of the literature evaluates the anchoring of inflation expectations from professional forecasters or from financial market data, while this paper assesses the anchoring of consumers' inflation expectations. To our knowledge, the only approach that studies the anchoring of consumers' expectations so far is the study by Easaw et al. (2013). The authors extend the epidemiological model by Carroll (2003) to test whether consumers anchor their expectations to professionals' forecasts or on the official inflation target. For a dataset of Italian consumers, the authors report that consumers anchor more on professionals' inflation forecasts than on the ECB's inflation target.

Our empirical approach is based on micro-level data from the University of Michigan Survey of Consumers. This dataset includes information on both short- and long-run inflation expectations of consumers in a rotating panel with two observations per individual. Therefore, we can identify the degree of anchoring via the co-movement between individual *changes* in expectations at different horizons, using both the cross-sectional as well as the time dimension for a sound identification.

Evaluating the degree of co-movement between US consumers' short- and long-run inflation expectations, we find that expectations became more anchored over time, but always contain a certain degree of co-movement. Interestingly, our results suggest that the turning point for the higher anchoring of inflation expectations was not the Volcker disinflation, but the period after the preemptive tightening by the Greenspan Fed around 1996. This is in line with the estimations in Carvalho et al. (2017). Our result could imply that consumers might need several years to learn about the new regime of inflation targeting and to incorporate it into their long-run inflation expectations.

To assess the relevance of experience in the spirit of Malmendier and Nagel (2011, 2016), we estimate the degree of anchoring for different age groups as well as birth cohorts. Our hypothesis is that there are significant differences between the anchoring of cohorts who experienced the high inflation spell of the 1970s-80s in the U.S. versus those that experienced mainly the low and stable inflation of the Great Moderation period. While we find that both young and old cohorts show a stronger anchoring of expectations over time, the degree of co-movement of the older generation remains more volatile compared to the younger cohort who has not experienced the high inflation rates of the 1970s.

A counterfactual analysis reveals that this effect is not driven by differences in income between the groups.

We further test for the sensitivity of cohorts' anchoring with respect to monetary policy shocks as well as monetary news perceived by consumers. Inattention as well as the weights attached to experienced developments can be a function of news. Moreover, a strand of the literature identifies anchoring in terms of the (in-)sensitivity to news using financial market data (Gürkaynak et al., 2010). Hence, this analysis gives further evidence on the degree of anchoring itself and also allows to distinguish some channels via which cohorts differ in their anchoring behavior. Regarding the news effects, we can show that monetary news observed by the consumer can matter, while monetary policy shocks in our analysis do not significantly affect the degree of anchoring. Most effects become insignificant in the post-1996 era, indicating again that long-run inflation expectations in general became more anchored in this period. When distinguishing between birth cohorts, it emerges that the older generation tends to react more strongly to their own interest rate expectations as well as news on money and credit market conditions. Both higher interest rate expectations as well as observed news on easy credit market conditions seem to signal dangers of higher future inflation for the older cohorts, and thus are related to a lower degree of anchoring of their long-run inflation expectations. By contrast, the younger generation reacts more strongly to recent inflation developments, and reacts symmetrically to news about price changes: News about higher prices are seen as a signal which affects both short- and long-run inflation expectations, while news about lower prices seem to lead to a stronger anchoring of long-run inflation expectations.

There exists a large body of literature on the anchoring of inflation expectations that our paper is related to. Notably, there is no unified approach to identifying "anchored inflation expectations". Approaches used in the literature range from investigating the movements of individual time series, like for instance deviations of inflation expectations from an explicit inflation target or the dispersion of inflation expectations, to strategies using advanced econometrics techniques that consider the response of high frequency financial market data.

Straightforward strategies to measure the anchoring of inflation expectations include analyzing the level, the volatility and the dispersion of expectations from survey data. Dovern et al. (2012) analyze disagreement among professional forecasters and state that anchored expectations imply that mean expectations stabilize at some target level and that cross-sectional dispersion is reduced.

Another strand of the literature defines expectations at different horizons as anchored if changes in expectations are insensitive to macroeconomic news. Inflation expectations are derived from high-frequency financial markets data, where forward rates for different maturities correspond to inflation expectations at different horizons. Studies by Beechey et al. (2011), Levin et al. (2004) and Gürkaynak et al. (2007, 2010) generally find that long-run expectations are more anchored, i.e. less sensitive to economic news, than short-

run expectations. Similarly, inflation expectations in inflation targeting countries appear to be better anchored. Applying a nonlinear estimation framework on the level of inflation expectations, Strohsal and Winkelmann (2015) report a contrasting result, where short-run expectations are more anchored than long-run expectations. Ehrmann et al. (2011) use daily financial market data to show that bond yields in European Monetary Union (EMU) member states converged more up until 2008 than yields in a control group, while implied long-run inflation expectations became more anchored.

Under the definition closest to our approach, inflation expectations are assumed to be anchored if changes in short-run expectations have no or little impact on long-run expectations. This is measured with the inflation pass-through criterion in Jochmann et al. (2010) and Gefang et al. (2012). Both studies extract short- and long-run inflation expectations from high-frequency data on forward inflation compensation in the US and the UK bond markets.[2] The authors test for the hypotheses of anchored, unmoored or contained expectations. Results suggest that inflation expectations are contained, i.e. they are not fully anchored, but move within a bounded interval. In the UK, results suggest that inflation expectations are contained within an interval around the inflation target. In a similar vein, Nautz and Strohsal (2015) and Strohsal et al. (2016) test for time-varying responsiveness of time series of long-run inflation expectations derived from financial market data to either short-run inflation expectations and news and report evidence that expectations became de-anchored during the recent financial crisis.

Finally, Kumar et al. (2015) evaluate the anchoring of firm managers' inflation expectations in a sample of New Zealand firms. Even though the country has a long tradition of inflation targeting and managers trust in the ability of the Bank of New Zealand to control inflation, their inflation expectations are un-anchored along several dimensions, such as given by a level significantly above the inflation target, a high degree of individual forecast uncertainty as well as a relatively high co-movement between short- and long-run expectations.

The rest of the paper is structured as follows. Section 2 relates our empirical definition of anchoring via the co-movement of short- and long-run inflation expectations to the theoretical literature and derives hypotheses on the expected differences in the degree of anchoring between birth cohorts that are driven by their respective inflation experiences. Section 3 presents the dataset and section 4 discusses the empirical results on the evolution of consumers' anchoring, differences between age and birth cohorts, a counterfactual analysis of differences across income groups and the effects of monetary news and monetary policy shocks. Finally, section 5 summarizes and concludes.

[2]High-frequency financial data does not identify inflation expectations directly. Rather, it helps to identify the inflation compensation which is the sum of inflation expectations and an inflation term premium. Under certain assumptions, the inflation compensation can shed light on the sensitivity of inflation expectations.

2 Anchoring of Inflation Expectations and Experience

From a theoretical perspective, the degree of anchoring of inflation expectations depends to a large extent on the expectations formation process. This affects both the strength of an inflation shock on expectations in general as well as the degree of co-movement between short- and long-run inflation expectations. A certain pass-through from short-run to long-run inflation expectations could be related to both theories of imperfect information (Sims, 2003; Mankiw and Reis, 2002; Carroll, 2003) as well as to theories with recursive learning (Orphanides and Williams, 2004, 2007). Under both types of models, *a priori* we would expect to observe some degree of co-movement between short- and long-run expectations as agents receive noisy signals about occurring shocks or only gradually learn the model-implied law of motion for inflation. Similarly, under both theories we would expect agents to anchor their long-run expectations more strongly as they receive additional information about the monetary policy reaction function, for instance in the form of an official inflation target.

To illustrate the theoretical relevance of experience, we look at learning models under parameter uncertainty. Beechey et al. (2011) present a model with imperfect knowledge and recursive learning as in Orphanides and Williams (2004, 2007) and use the models' implications to show that the anchoring of long-run inflation expectations, i.e. their sensitivity to an inflation shock, differs with the monetary policy regime. This model gives important insights for our analysis. First, it shows that with recursive learning, there is always co-movement between short- and long-run expectations because agents learn the true law of motion for inflation recursively over time. Second, this co-movement becomes stronger, the more uncertain people are about monetary policy targets and the smaller the reaction of the central banks to inflation deviations is. Hence, inflation expectations will generally be more anchored if the central bank has an explicit inflation target, as this reduces agents' learning problem. In addition, a stronger reaction of the central bank to inflation deviations reduces the effect of actual inflation on inflation expectations and increases the effect of the inflation target, thus anchoring expectations more closely to the target.

Agents infer the dynamics of inflation via recursive learning:

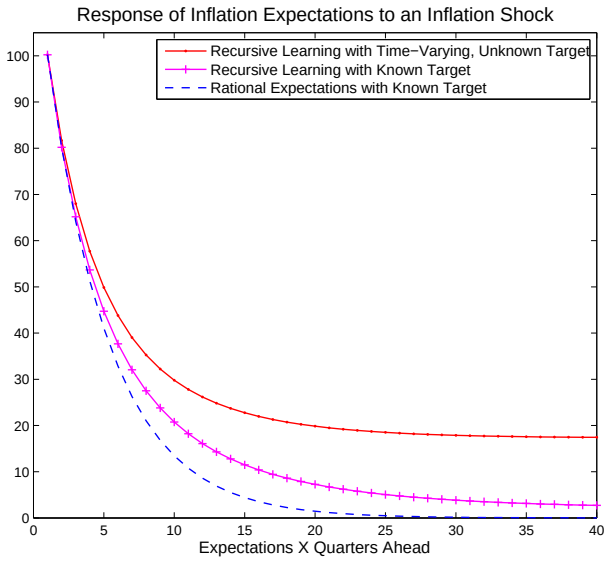
$$\pi_t = \hat{c}_{1,t} + \hat{c}_{2,t}\pi_{t-1} + \nu_t \tag{1}$$

The vector of coefficients c_t in equation (1) is updated recursively according to:

$$c_t = c_{t-1} + \kappa R_t^{-1} X_t'(\pi_t - X_t c_{t-1}) \tag{2}$$

$$R_t = R_{t-1} + \kappa(X_t X_t' - R_{t-1}) \tag{3}$$

Figure 1: Co-movement in the Recursive Learning Model



Note: Mean coefficients from 600 simulations.

where κ denotes a small, positive Kalman gain which ensures that agents never fully converge on the true values of c_1 and c_2. Agents estimate the central banks' inflation target π^* to be $\hat{c}_{1,t}/(1-\hat{c}_{2,t})$. The learning problem is thus simplified if the central bank announces an explicit inflation target since this removes the constant term from equation (1). Figure 1 shows the results of numerical simulations of the model under different monetary policy regimes. We generally observe a positive co-movement between expectations at different horizons, which increases in more uncertain monetary policy regimes. This implies that a transition to a time-varying inflation target will increase the co-movement between short- and long run inflation expectations. Hence, allowing for a temporary increase of the inflation target to 4% in the model leads to a lower anchoring of inflation expectations.

This setup can be extended to model the effects of learning by experience. Borrowing from Malmendier and Nagel (2011, 2016), we can relax the assumption that all individuals learn based on all data available and with the same gain. In contrast to the standard assumption that agents use all historical data in their learning procedure, the authors propose that only the data available in agents' own lifetime may be used. This implies that expectations become history-dependent and vary across age cohorts, so that at each moment in time heterogeneous expectations between generations will persist. Learning by experience leads to gains $\kappa_{t,s}$ in the learning algorithm that vary across time t and cohort s:

$$c_{s,t} = c_{s,t-1} + \kappa_{s,t} R_{t,s}^{-1} X_t' (\pi_t - X_t c_{s,t-1}) \quad (4)$$

$$R_{s,t} = R_{s,t-1} + \kappa_{s,t} (X_t X_t' - R_{s,t-1}) \quad (5)$$

Notably, the specification of the gain parameter is crucial. Agents may weight all past information equally (i.e. $\kappa_{s,t} = 1/T$), experiences early in their lifetime might have a lasting impact or memories might fade away soon so that agents weight recent observations more strongly.[3] Malmendier and Nagel (2011, 2016) show that experience can explain a large part of the disagreement regarding expected inflation of young and old survey respondents in the U.S., differences in household borrowing and saving behavior as well as different risk-taking attitudes in bond and stock markets. In the context of the anchoring of inflation expectations, a hypothesis would be that the degree of anchoring over time depends not only on the current monetary policy, but also on past memories of monetary policy and resulting inflation rates. This would imply that unsustainable monetary policy might have longer lasting consequences than previously assumed.

Very recently, Carvalho et al. (2017) set up a New Keynesian model with a state-dependent learning algorithm regarding agents' estimate of the long-run inflation trend, i.e. long-run inflation expectations. Depending on the size of short-run shocks to inflation, agents estimate the long-run trend either with decreasing or with constant gain. This implies that in periods of relatively small shocks, beliefs converge to the model-consistent estimate and long-run inflation expectations are insensitive to short-term shocks and anchored according to the definition in Carvalho et al. (2017). Notably, this definition is closely related to our empirical definition of anchoring. By contrast, with frequent and larger shocks to inflation, the long-term trend is estimated with constant gain as a weighted average of past inflation rates, so that expectations become un-anchored. The authors show that their model estimates closely track the dynamics of low-frequency movements in inflation and of long-run survey expectations in the US, including the University of Michigan Survey of Consumers analyzed in this paper. In that sense, their model gives a theoretical underpinning to our definition of anchoring. We then apply this definition to test for the relevance of differences in inflation experience between cohorts regarding their anchoring.

3 The Data

We employ microdata from the University of Michigan Survey of Consumers, which is available for the sample period January 1978 to September 2017 at a monthly frequency. For our analysis, we consider 36-months moving-averages measuring the degree of co-movement between short- and long-run expectations, which contain the current and 35 future months. Moreover, we drop the last six months of the sample as they might contain respondents which have not yet been surveyed a second time. Our sample thus runs from

[3]There may also be other ways to motivate the relevance of past experience. Eichberger and Guerdjikova (2013) highlight case-based belief formation where consumers try to relate the current situation to a situation in the past with similar circumstances and then base their decision on that. For instance, if consumers experienced an inflation spell in the past, an inflation spell today will remind them of that situation and will lead to a similar response.

February 1981 to March 2017. For the analysis of age and birth cohorts, we start the sample in October 1990 in order to ensure that there are sufficient observations in each monthly cohort.

For the analysis of the dynamics of individuals' inflation expectations, we exploit the fact that the Michigan Survey of Consumers includes a rotating panel: Each month, a randomly determined sub-sample of consumers is chosen to be re-interviewed six months after the first interview. The complete cross-section each month includes about 40% of individuals that are interviewed for the second time.[4] Via the rotating panel structure of the survey, we are able to identify changes in expectations on an individual consumer level. In order to rule out extreme values for inflation expectations, we further truncate our sample by excluding the upper and lower 2.5% of the distribution of both short- and long-run quantitative inflation expectations.

For the evaluation of changes in individuals' inflation expectations, we use the questions from the survey asking for individuals' quantitative estimates of short-run and long-run inflation expectations. The precise questions of the survey read:

A12b. "By about what percent do you expect prices to go (up/down) on the average, during the next 12 months?"

A13b. "By about what percent per year do you expect prices to go (up/down) on the average, during the next 5 to 10 years?"

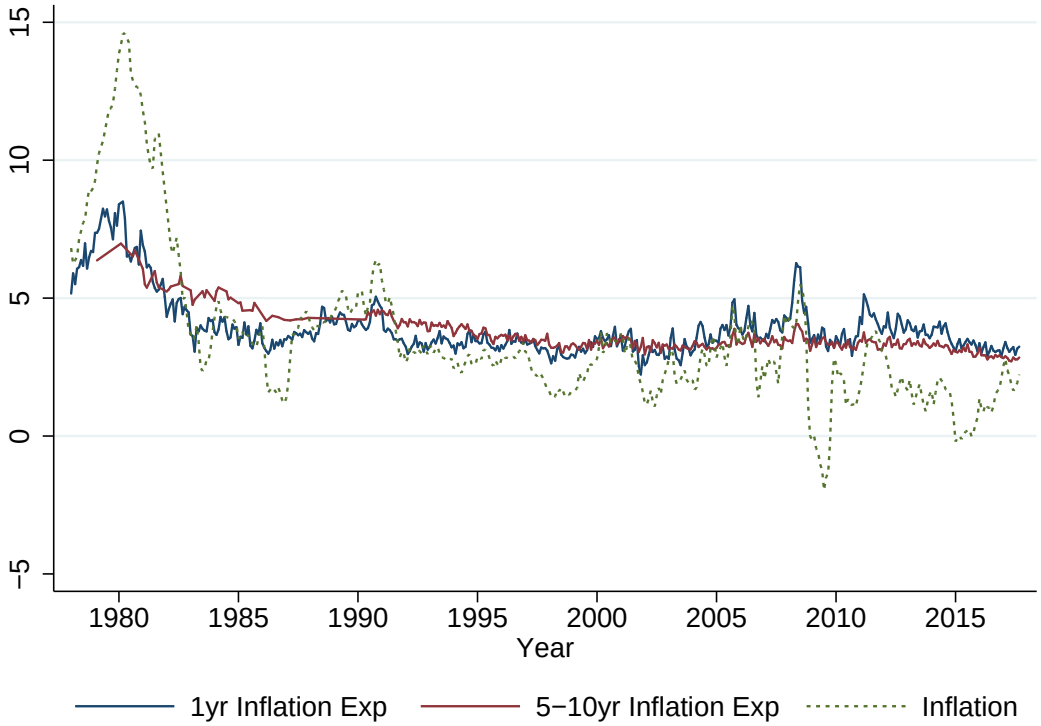
Time series of consumers' mean quantitative short- and long-run inflation expectations from the Michigan Survey are presented in Figure 2. Both short- and long-run inflation expectations declined considerably during the disinflation period in the 1980s. After a period of stabilization, it seems that short-run expectations became more volatile after 2002, while long-run expectations remained stable at around 3%. Interestingly, both short- and long-run inflation expectations remained remarkably stable during the drop in actual inflation rates in the aftermath of the financial crisis. While consumers' short-run inflation expectations even increased temporarily, we observe a slight downward trend in short- and long-run expectations after about 2012.

As we are also interested in evaluating the role of news effects on the stability of inflation expectations, we employ the question in the Michigan Survey of Consumers asking for news on the economy heard by the respondent as a measure of perceived news regarding inflation and other potentially relevant topics. The wording of the question is as follows:

A6. "During the last few months, have you heard of any favorable or unfavorable changes in business conditions?"
1. YES 2. NO

[4] For further details on the University of Michigan Survey of Consumers, see http://www.sca.isr.umich.edu.

Figure 2: Short- and Long-run Inflation Expectations



If the question is answered with "yes", an open question with two possible answers follows:

A6a. "What did you hear? (Have you heard of any other favorable or unfavorable changes in business conditions?)"

The answers are coded into categories by the Michigan Survey of Consumers. For our purposes, we construct dummy variables on perceived news regarding monetary conditions. Specifically, we distinguish between news heard about high and low inflation or prices with the dummy variables *newsprices_high* and *newsprices_low*. News on money and credit conditions are measured by the dummy variables *newsmoney_tight* and *newsmoney_easy*, where the former takes on the value of one if the consumer reports news heard on *"tight money, interest rates high"*, while the latter includes news on *"easier money, credit easy to get, low interest rates"*.

In addition to the microdata from the Michigan Survey of Consumers, we aim at capturing monetary policy surprises by evaluating the conference calls held by the Federal Open Market Committee of the Fed. Conference calls are unscheduled meetings that usually take place after surprising events or in times of economic turmoil which may require monetary policy action before the next scheduled meeting. Monetary policy surprises are then identified by the dummies *i_shock* and *alt_mp_shock*, where the former identifies those periods where the Fed decided on an interest rate adjustment during the conference call and the latter measures those periods where alternative monetary policy measures,

such as quantitative easing, where decided. An additional measure of monetary policy shocks is taken from the literature: Kuttner (2001) extracts monetary policy surprises, measured in basispoints, from daily data of the Federal Funds futures market (the dataset starts in 1989m6 and is extended until 2008m6 by the author). We convert the daily data into monthly frequency. Finally, we control for effects of actual inflation with CPI inflation for the US obtained from the FRED database at the Federal Reserve Bank of St. Louis. We estimate inflation persistence based on a Phillips curve relationship, where the inflation rate in the current month depends on the inflation rate observed in the recent past, the unemployment rate in the previous month, and a constant. The persistence measure is defined as the coefficient on the lag of inflation.

4 Results

4.1 Anchoring of Inflation Expectations Over Time

To analyze the time-varying degree of anchoring of long-run inflation expectations, we run the following regression:

$$\Delta\pi_{it}^{e(5-10y)} = \alpha_t + \beta_t \Delta\pi_{it}^{e(1y)} + \varepsilon_{it}, \tag{6}$$

where $\Delta\pi_{it}^{e(5-10y)}$ is the individual change in 5-10 years ahead inflation expectations over the six months between interviews and $\Delta\pi_{it}^{e(1y)}$ is the corresponding change in short-run inflation expectations. We are interested in the strength of the co-movement between an adjustment in short-run and in long-run expectations. If long-run expectations are firmly anchored, the coefficient β_t should be statistically insignificant, implying that an individual adjustment in short-run inflation expectations between the two interviews is not reflected in a corresponding adjustment of long-run expectations. However, theory suggests that if people cannot identify shocks and have to learn the policy response function of the central bank, a positive co-movement emerges.

In order to identify longer-term movements in the degree of anchoring, we aggregate all individuals over a rolling window of 36 months, starting in the current month and moving forward.[5] Both short- and long-run inflation expectations are truncated by dropping the upper and lower 2.5% of the distribution. Table 1 gives the summary statistics of the time-varying coefficient β_t using the 36-months aggregation, where the corresponding time variation is shown in Figure 3. With regard to the summary statistics, we observe that a 1 percentage-point change in short-run inflation expectations leads to a change in

[5]There are obviously several ways to calculate time-varying coefficients in this set-up. Besides using a moving window, one could use a state space formulation or estimate the equation on a monthly frequency and apply a filter/smoother on those estimates. We opted for the simplest alternative where the assumptions underlying the estimator as well as the implications for the estimation parameters (e.g. variance, etc) are well studied.

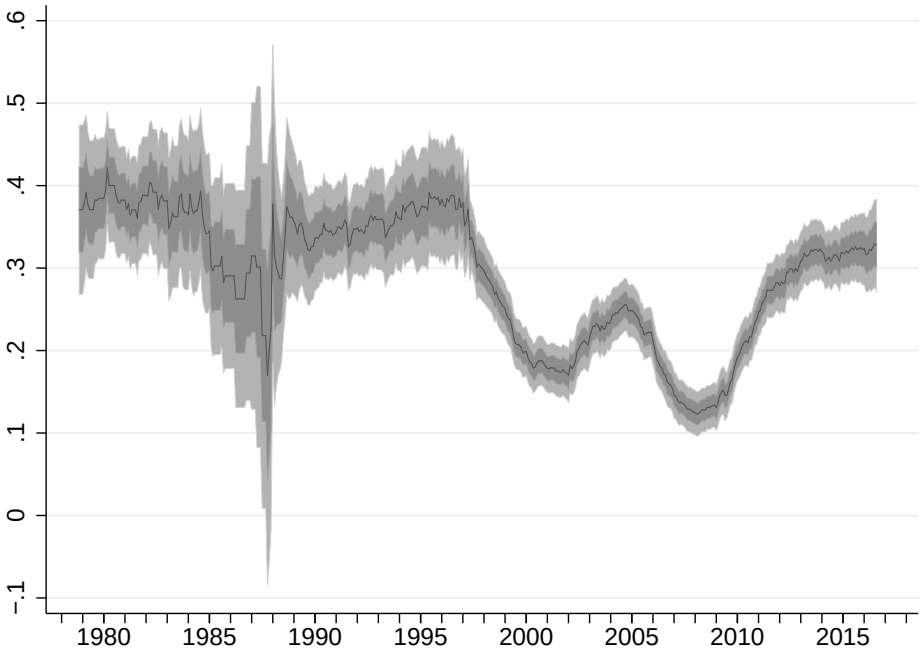
long-run expectations of 0.29 percentage-points on average. Notably, the degree of co-movement varies substantially over time, but always remains significant. It can rise up to 0.40 and be as low as 0.12 percentage-points.[6] The estimations include 4,652 individual consumers on average per window.

Table 1: Summary Statistics of Co-movement

Variable	Mean	Std. Dev.	Min.	Max.
β_t	0.29	0.08	0.12	0.40
Standard Error	0.03	0.02	0.01	0.13
Observations	4,651.86	1,646.43	159	6,382

Note: Results based on 433 regressions over the period 1981m2-2017m3.

Figure 3: The Strength of Co-movement Between Short- and Long-Run Inflation Expectations



Note: The regression coefficient β_t from equation (1) is plotted, showing the coefficient estimate of a change in one year ahead inflation expectations on the change of 5-10 years ahead expectations. Shaded areas denote confidence bands at the 5% and the 10% level.

Figure 3 plots the 36-months moving average of the co-movement coefficient β_t over time together with the corresponding confidence bands. It shows that over the recent 35

[6] Alternatively, we estimate this equation in levels instead of six-months differences using a random-effects panel estimator. This leads to very similar results. Figure A.1 in the appendix shows the corresponding graph. The coefficient estimate for a one-unit increase in short-run inflation expectations increases from 0.29 percentage-points to 0.53 percentage-points on average and is again highly significant.

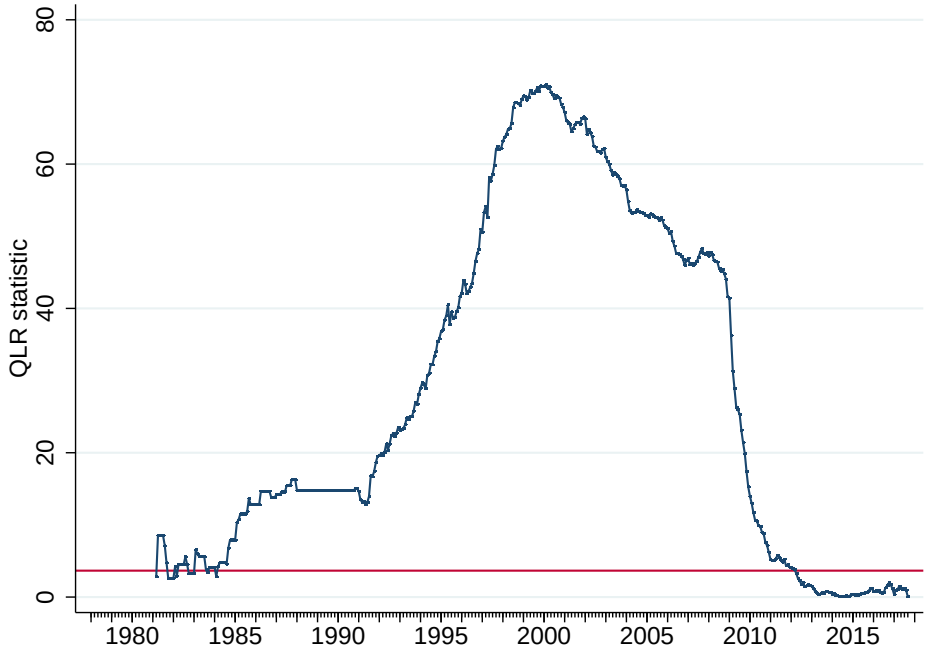
years, a decoupling of short- and long-run expectations seems to have taken place. Until about 1996 or 1997, the co-movement of inflation expectations was much stronger and fell substantially afterward.[7] The results thus reveal that consumers' inflation expectations became considerably more anchored in recent years. Until the beginning of the financial crisis in 2008, the lower co-movement was remarkably stable over the business cycle. Our results suggest that the experience of the recent recession has coincided with a stronger co-movement of short- and long-run expectations, suggesting that some de-anchoring of inflation expectations has taken place. Nevertheless, the degree of co-movement stabilized at values below those in the pre-1996 period in recent years.

In order to formally test for a structural break with unknown break date, we calculate the Quandt likelihood ratio (QLR) statistic over our sample period, shown in Figure 4 together with the 5% critical value. Figure 4 shows that the QLR statistic increases strongly during the period 1994-1999, indicating a substantial change in the relationship. While it seems difficult to exactly pinpoint the break date from the test results, visual inspection of the change in co-movement in Figure 3 and the QLR test statistic in Figure 4 together with our knowledge of changes in the Fed's monetary policy during this period suggest that 1996 might be a good reference point for the structural break: After the Volcker Disinflation until 1987, the new Chairman Greenspan conducted the first preemptive strikes against inflation during the years 1994-1996, thereby further reinforcing the Fed's determination to maintain stable inflation rates. The timing of the end of these preemptive actions in 1996 thus gives an interpretation to the observed structural break in terms of changes in the conduct of monetary policy. Notably, our results remain qualitatively the same if we choose 1997 or 1998 as the breakpoint date.

Hence, even after the Volcker Disinflation until 1987, when inflation rates were already quite low, inflation expectations were – according to our definition – still not very well anchored. In line with learning models, this could imply that consumers required several years of falling inflation rates in order to learn about the new monetary policy regime. Furthermore, it could be that the Greenspan Fed's first preemptive actions against inflation over the years 1994 to 1996 provided the trigger for a substantial anchoring of inflation expectations. Another explanation could be the emerging belief at that time, that higher growth rates at lower inflation rates were possible due to technological change. In that line of argument, Leigh (2005) evaluates the implicit inflation target in the U.S. and finds that it was lowered after the 1990/91 recession, which roughly coincides with the timing of our structural break.

[7] The increased variation from 1988 until 1990 is explained by missing long-run expectations in the Michigan survey.

Figure 4: QLR Breakpoint Test – Strength of Co-movement



Note: The red line represents the 5% critical value.

4.2 Differences in the Degree of Anchoring between Birth and Age Cohorts

Next, we evaluate whether the degree of anchoring differs across birth and age cohorts. If the results show significant differences in the anchoring of young versus old cohorts, this will imply that learning from experience as in Malmendier and Nagel (2011, 2016) influences not only the expectation formation *per se*, but also the co-movement between short- and long-run expectations.

Figures 5 and 6 show the time-varying strength of co-movement, estimated separately for consumers born in 1950 or before and born in 1960 or after, as well as for consumers aged 60 or older and 40 or younger in each cross-section. The former definition allows us to separate those consumers who experienced the high inflation rates in the 1970s in their active economic lives from those consumers who are more likely to only have experienced the disinflation and the following stable inflation rates. The latter definition differentiates between older and younger cohorts in each cross-section in line with the analysis in Malmendier and Nagel (2016).[8]

Both birth and age cohorts exhibit an interesting pattern: After the Volcker disinflation and during the following period of relatively stable inflation rates from 1990 onwards,

[8]In order to ensure that there are at least 150 respondents per cohort for each month, we start the analysis of birth cohorts in October 1990 and consequently, to make it comparable, use the same sample also for the evaluation of age cohorts.

Figure 5: Differences in Co-movement by Birth Cohort

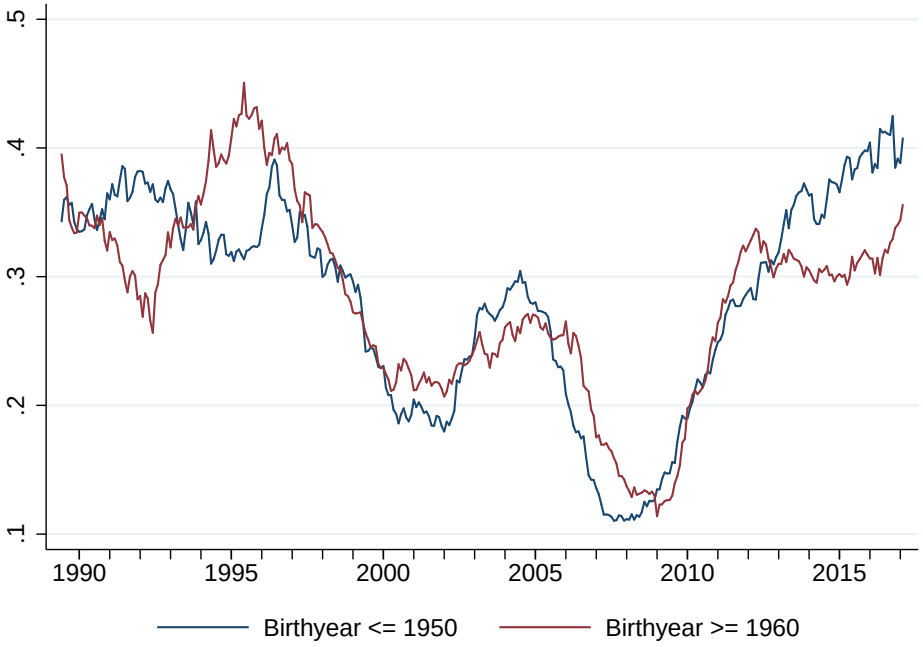


Figure 6: Differences in Co-movement Between Age Groups

it seems that the co-movement of the older cohorts' expectations under both definitions remains more volatile than those of the younger cohorts. Nevertheless, the degree of anchoring of old and young cohorts follows the same general trend. Hence, while expectations in general became more anchored after the mid-1990s, it seems that the anchoring is much more fragile for the generation that experienced the high inflation rates of the 1970s. If this experience receives a high weight in their learning algorithm, this implies

Table 2: Co-movement Across Birth and Age Cohorts

Co-movement Coeff.	Mean	Std. Dev.
	Sample: 1990m10-2017m3	
Born before 1950	0.281	0.084
Born after 1960	0.280	0.074
Difference tests	t 0.575	F 1.2796**
Older than 60	0.281	0.092
Younger than 40	0.276	0.068
Difference tests	t 1.3377	F 1.8235***
	Sample: 1996m1-2017m3	
Born before 1950	0.265	0.086
Born after 1960	0.263	0.069
Difference tests	t 1.1083	F 1.5579***
Older than 60	0.261	0.090
Younger than 40	0.262	0.066
Difference tests	t -0.4791	F 1.8477***

Note: *** p<0.01, ** p<0.05, * p<0.1

that any shocks to inflation will rekindle fears of high inflation and are, thus, more likely to impact also on their long-run inflation expectations. This becomes especially visible in the period after and during the recent Great Recession, where both older birth and age cohorts exhibit a much steeper and more persistent increase in the co-movement, hence a stronger de-anchoring of inflation expectations. Turning this into a policy implication, our results indicate potential additional costs of an inflationary monetary policy regime: While it is possible for a central bank to increase the anchoring of expectations across the whole population after changing to a regime of stable inflation, the cohorts which lived through a high-inflation period will have less anchored expectations than cohorts that faced more stable inflation and had well-anchored expectations from the start.

The summary statistics of the degree of co-movement across birth and age cohorts are presented in Table 2. In line with the visual inspection of Figure 5, we observe that older cohorts' short- and long-run inflation expectations show both a stronger co-movement, i.e. a lower degree of anchoring, as well as a higher volatility. While the differences in mean co-movement are small and not statistically significant, the variance in the degree of anchoring is significantly larger for the older cohorts, both for the period since October 1990 and the more stable period since January 1996. Hence, the cohorts that experienced the high inflation of the 1970s in our sample continue to remain more sensitive regarding the anchoring of inflation expectations. Furthermore, it is in line with our expectations that the test statistics become stronger when the cohorts are separated by age, as towards the end of the sample the group that only experienced the Great Moderation period increases within the young cohort.

4.3 Counterfactual: The Role of Income

In this section, we run a counterfactual analysis to verify whether the differences in anchoring across birth and age cohorts that we observe in the previous section are related to group-specific criteria other than cohort experience. Specifically, we check for effects from consumers' household income. One could hypothesize that age groups have significant income differences due to their different positions in the life-cycle and that, therefore, any observed differences in the anchoring behavior are in fact driven by differences in income and spending/saving behavior. For instance, the older generation could be more dependent on their previous savings than the younger generation and, hence, more sensitive regarding inflation.

Table 3: Summary Statistics Income across Age Groups and Cohorts

	Mean	Median	SD	Min	Max	N
Born before 1950	53,129.43	45,000	36,481.42	4,836	198,000	45,002
Born after 1960	61,653.39	50,000	40,446.86	4,897	198,000	45,800
Age below 40	54,583.78	45,000	35,963.04	4,897	198,000	41,632
$40 < \text{Age} \leq 60$	59,007.96	50,000	39,091.28	4,836	198,900	116,117
Age above 60	52,385.00	40,000	38,138.12	4,992	198,900	31,712

Note: Sample from 1990m10-2017m3 with truncated income at top/bottom 2.5% and truncated short- and long-run inflation expectations at top/bottom 2.5%.

Summary statistics of total household income across age groups and birth cohorts for the relevant sample period from 1990m10-2017m3 are shown in Table 3, where we truncate both income as well as short- and long-run inflation expectations by dropping the upper and lower 2.5% of the distribution. As expected, the middle-age group has the highest income, both in the mean and in the median. While the range of incomes is approximately the same across all groups, we also observe that the older groups, both in terms of age and in terms of birth cohort, have lower incomes than the young. This distinction is slightly less pronounced when we distinguish between birth cohorts, but nevertheless significant across all groups.

Evaluating the degree of co-movement between short- and long-run inflation expectations across income quartiles from 1990m10 onwards in Table 4, we observe that the average degree of co-movement increases with lower income, where the lower two income quartiles have a significantly higher co-movement, thus lower degree of anchoring, than the upper two income quartiles. Hence, part of the observed lower degree of anchoring of older generations' long-run inflation expectations could indeed be driven by income differences.

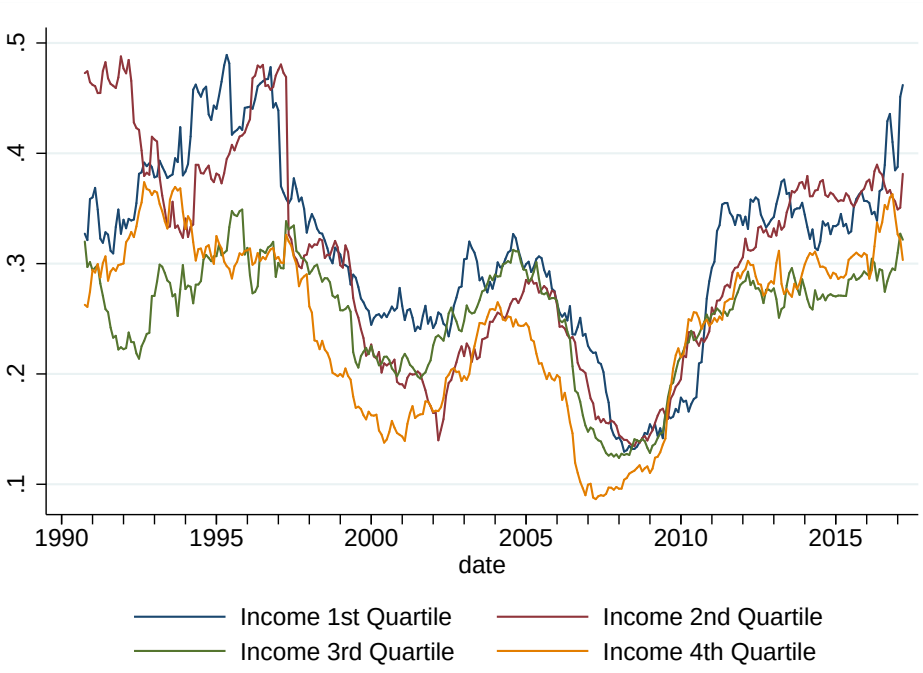
However, with respect to the time-variation of co-movement, shown in Figure 7, we observe a different pattern: It seems that the higher average co-movement we observe before 1996 in the full cross-section was in fact driven by the lower income groups, whereas

Table 4: Co-Movement Across Income Groups

Co-movement Coeff.	Mean	Std. Dev.
	Sample: 1990m10-2017m3	
1^{st} income quartile	0.312	0.084
2^{nd} income quartile	0.300	0.096
3^{rd} income quartile	0.254	0.052
4^{th} income quartile	0.245	0.075
Multivariate equality of means test		F 251.22***
	Sample: 1996m1-2017m3	
1^{st} income quartile	0.293	0.079
2^{nd} income quartile	0.274	0.087
3^{rd} income quartile	0.247	0.054
4^{th} income quartile	0.226	0.072
Multivariate equality of means test		F 182.91***

Note: *** p<0.01, ** p<0.05, * p<0.1

Figure 7: The Strength of Co-movement Across Income Groups



those in the upper two income quartiles exhibit a lower degree of co-movement already before 1996.[9] In that sense, a lower degree of anchoring might be also related to differences in forecast accuracy across income and education groups that are frequently found in the literature (Pfajfar and Santoro, 2009; Anderson et al., 2010). Around 1996, the co-movement drops also for the lower income groups. This is confirmed by summary statistics

[9]Extending the estimation to the beginning of our sample period in 1978 does not change this result.

of co-movement from 1996m1 onwards in the lower panel of Table 4. After the pre-emptive tightening by the Fed, we observe some convergence in the degree of co-movement across income groups, especially in terms of the standard deviation.

In contrast to the comparison of age groups and birth cohorts, we thus do not find that lower income groups remain more sensitive with respect to their long-run inflation expectations after the general increase in anchoring after 1996. While the differences in mean co-movement are still significant, the differences in the volatility of co-movement are considerably reduced. By contrast, when distinguishing between age groups and birth cohorts, we observe that the main difference between the groups is the degree of volatility in the co-movement, i.e. the sensitivity of the anchoring, which persists even after 1996. In that sense, while income differences might account for some of the differences in mean co-movement across age cohorts, they cannot account for their evolution over time and for the finding that older cohorts exhibit a more volatile degree of anchoring throughout.

4.4 News Effects, Anchoring and Experience

In the previous sections, we show that the anchoring of consumers' inflation expectations in the U.S. has changed over time and that it differs between birth and age cohorts. This section sheds light on the determinants that may affect the anchoring of expectations and checks whether their influence also has changed over the sample period. In line with the previous literature on the anchoring of inflation expectations, we concentrate on the effects of economic news and shocks. From the Michigan Survey dataset, we have a very clear identification of perceived news, with the great advantage of capturing only those news that are indeed absorbed and recalled by the consumer (i.e. the receiver perspective). Anchoring of expectations means also a certain insensitivity to short-term news effects. From our previous results, an *a priori* hypothesis would be that news loose explanatory power as long-run inflation becomes more anchored in the second half of our sample period. Additionally, we test for effects from different monetary policy shocks, as defined in section 3. Again, an *a priori* hypothesis would be that shocks have less effects on long-run inflation expectations, and thus on the degree of anchoring, in the later sample.

To test for the influence of our set of news and economic shocks on the strength of the co-movement, we take the coefficient β_t from the 36-months moving average cross-sectional regressions of equation (6) as a dependent variable. Since the dependent variable is a monthly time series, we calculate 36-months moving averages of the monthly shares of consumers who reported news from the individual news variables and of the balance statistic of qualitative interest rate expectations.[10] Further effects from macroeconomic dynamics are controlled for by including a lagged dependent variable, lagged inflation and inflation persistence as well as year fixed effects. The dummy $fedtarget$ measures the

[10]The balance statistic is defined as the monthly difference between the number of consumers expecting rising versus falling interest rates in relation to the overall number of consumers reporting interest rate expectations.

additional effect of the introduction of the explicit inflation target by the Fed in 2012m1. In order to avoid the generated regressor problem, we show results with bootstrapped standard errors.

The results for the determinants of the average strength of co-movement within the whole cross-section are reported in Table 5. While actual inflation dynamics have no significant effect on consumers' degree of anchoring, we observe a smaller co-movement, i.e. stronger degree of anchoring, with a higher persistence of inflation, while the co-movement tends to be larger if a higher share of consumers believes that nominal interest rates will rise. Interestingly, we find no significant effect of either measure of monetary policy shock over the whole estimation period and only a marginally significantly positive effect from observed news on easy money and credit market conditions.

When we split the sample period in 1996, we note that after the disinflation period and the preemptive tightening, the co-movement between short- and long-run inflation expectations in the whole cross-section no longer reacts significantly to any news on prices and credit market condition or to monetary policy shocks. This implies that as inflation expectations became more anchored, the transmission of transitory shocks (news and macroeconomic shocks) to long-run inflation expectations was reduced. At the same time, the persistence of the measured degree of co-movement becomes significantly higher after 1996 and we observe a positive effect from a higher share of consumers expecting rising interest rates. This could imply that potential disruptions in the degree of anchoring, for instance due to a change in consumers' interest rate expectations as the Fed started to tighten its monetary policy stance during the recovery from the Great Recession, might have longer-lasting implications for the anchoring of long-run inflation expectations than was the case before 1996.

Next, we evaluate whether birth year cohorts' co-movement of short- and long-run expectations is affected differently by news and monetary policy shocks. Table 6 presents the effects of news and monetary shocks on the degree of co-movement for those born until 1950 and those born after 1960.[11] If one assumes the same gain specification as in Malmendier and Nagel (2011, 2016), younger cohorts use a shorter time span and have higher gains. With respect to our regression coefficients, this implies that younger cohorts might be expected to react more strongly to monetary policy shocks and news compared to older cohorts. At the same time, if the older cohort's degree of anchoring remains affected by their experience of high and volatile inflation rates in the 1970s, we might also expect that the co-movement of their short- and long-run expectations is more sensitive to certain shocks which signal risks of higher inflation.

[11] The corresponding estimations for age groups 60 or older and 40 or younger are shown in Table A.1 in the Appendix. Most results remain robust also in this specification of cohorts.

Table 5: Determinants of the Strength of the Co-movement

				Before 1996		After 1996	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
β_{t-1}	0.6261***	0.6263***	0.7575***	0.4920***	0.5215***	0.8084***	0.7624***
	(0.1078)	(0.1224)	(0.0575)	(0.1627)	(0.0947)	(0.0571)	(0.1092)
π_{t-1}	-0.0006	-0.0007	0.0006	-0.0065**	0.0030	0.0005	0.0005
	(0.0013)	(0.0015)	(0.0008)	(0.0028)	(0.0035)	(0.0005)	(0.0010)
$\pi_{t-1}^{persistence}$	-0.0132*	-0.0130*	-0.0069	0.0045	0.0115	-0.0086	-0.0129*
	(0.0077)	(0.0072)	(0.0065)	(0.0157)	(0.0151)	(0.0073)	(0.0076)
balance stat $i_t^{e(1y)}$	0.0457	0.0453	0.0260**	-0.0890	0.1088	0.0423**	0.0457
	(0.0389)	(0.0520)	(0.0132)	(0.0815)	(0.1469)	(0.0183)	(0.0360)
$fedtarget_t$	0.0054*	0.0054*				0.0059**	
	(0.0031)	(0.0031)				(0.0028)	
$share\_newsprices\_high_t$	-0.0516	-0.0442	-0.0887	0.0245	0.9018	-0.0311	-0.1041
	(0.0648)	(0.0552)	(0.0848)	(0.6122)	(1.3086)	(0.0528)	(0.0700)
$share\_newsprices\_low_t$	-0.0523	-0.0551	0.4868	0.7826	-1.7351	-0.0785	0.7537
	(0.1747)	(0.1385)	(0.5187)	(0.7289)	(2.8909)	(0.1272)	(0.5233)
$share\_newsmoney\_easy_t$	0.5890	0.6010*	0.0102	0.5639	-0.0450	0.5235	0.7565
	(0.3961)	(0.3122)	(0.3574)	(0.4482)	(0.6544)	(0.6242)	(1.0619)
$share\_newsmoney\_tight_t$	0.2429	0.2449	-0.0030	0.8035**	-0.5660	-0.1275	0.0831
	(0.1587)	(0.2785)	(0.1496)	(0.3880)	(0.7985)	(0.1955)	(0.3097)
i_shock_t		-0.0004		-0.0016		-0.0013	
		(0.0026)		(0.0064)		(0.0011)	
$alt\_mp\_shock_t$		0.0020		0.0012		-0.0009	
		(0.0020)		(0.0043)		(0.0013)	
$kuttner\_mp\_shock_t$			0.0000		-0.0001		0.0001
			(0.0000)		(0.0001)		(0.0001)
Constant	0.1008***	0.1008***	0.0273**	0.2023***	0.1398**	0.0429**	0.0112
	(0.0225)	(0.0235)	(0.0112)	(0.0665)	(0.0663)	(0.0173)	(0.0261)
Observations	434	434	229	180	79	255	150
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.980	0.979	0.995	0.854	0.850	0.995	0.994

Note: Bootstrapped standard errors in parentheses. Sample from 1981m2-2017m3. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Determinants of the Strength of the Co-movement Across Birth Cohorts

	Birth Year $\leq$ 1950			Birth Year $\geq$ 1960		
	(1)	(2)	(3)	(4)	(5)	(6)
β_{t-1}	0.7538***	0.7526***	0.7202***	0.7897***	0.7897***	0.7334***
	(0.0425)	(0.0402)	(0.0458)	(0.0455)	(0.0463)	(0.0707)
π_{t-1}	0.0001	-0.0001	0.0006	0.0016*	0.0017*	0.0019
	(0.0007)	(0.0009)	(0.0013)	(0.0009)	(0.0010)	(0.0014)
$\pi_{t-1}^{persistence}$	-0.0078	-0.0078	-0.0119	-0.0017	-0.0016	-0.0004
	(0.0069)	(0.0086)	(0.0095)	(0.0070)	(0.0077)	(0.0079)
balance stat $i_t^{e(1y)}$	0.0585**	0.0595**	0.0577**	0.0407	0.0400	0.0347
	(0.0244)	(0.0243)	(0.0251)	(0.0307)	(0.0261)	(0.0292)
$fedtarget_t$	-0.0022	-0.0023		0.0007	0.0008	
	(0.0057)	(0.0049)		(0.0032)	(0.0037)	
$share\_newsprices\_high_t$	-0.0356	-0.0287	-0.0413	0.1707*	0.1677**	0.1106
	(0.0512)	(0.0674)	(0.1067)	(0.0956)	(0.0704)	(0.0953)
$share\_newsprices\_low_t$	-0.0005	-0.0023	0.1235	-0.3237**	-0.3230*	1.2272
	(0.3729)	(0.3347)	(0.4956)	(0.1521)	(0.1936)	(0.8913)
$share\_newsmoney\_easy_t$	1.2501**	1.2485*	1.5001**	-0.0829	-0.0733	0.1661
	(0.5847)	(0.6413)	(0.6893)	(0.8152)	(0.8924)	(0.7025)
$share\_newsmoney\_tight_t$	0.1922	0.1870	0.3930**	-0.2455	-0.2405	-0.0876
	(0.2453)	(0.2162)	(0.1918)	(0.3045)	(0.2518)	(0.2113)
i_shock_t		0.0011			-0.0009	
		(0.0021)			(0.0026)	
$alt\_mp\_shock_t$		0.0022			-0.0012	
		(0.0017)			(0.0023)	
$kuttner\_mp\_shock_t$			-0.0000			-0.0001
			(0.0001)			(0.0001)
Constant	0.0729***	0.0731***	-0.0097	0.0568**	0.0569**	-0.0027
	(0.0254)	(0.0250)	(0.0217)	(0.0242)	(0.0251)	(0.0216)
Observations	318	318	213	318	318	213
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.990	0.990	0.990	0.989	0.989	0.987

Note: Bootstrapped standard errors in parentheses. Sample from 1990m2-2017m3. *** p<0.01, ** p<0.05, * p<0.1

Looking at Tables 6 and A.1, it seems that indeed the cohorts react differently.[12] First, we observe a strong positive effect on the co-movement for the older generation regarding a higher share of respondents with increasing interest rate expectations and regarding news on easy money and credit conditions. Both can signal risks of higher inflation rates in the future, and seem to trigger a de-anchoring of inflation expectations only for the older generation. At the same time, the younger generation is more sensitive regarding recent inflation developments and news about price changes. In particular, news about rising or falling prices affect the co-movement of the young in a symmetric manner.

5 Conclusion

In this paper, we investigate the degree of anchoring of long-run inflation expectations of consumers in the U.S. We add to the literature by shedding light on consumers' behavior based on a rich micro dataset. Specifically, we analyze the co-movement of short- and long-run inflation expectations at the individual level over time. For a sound identification, we employ the rotating panel microstructure of the Michigan Survey of Consumers. This allows us to track the simultaneous adjustment of short- and long-run expectations of individuals over time. In addition, we investigate the relevance of past inflation experience across birth and age cohorts for the degree of anchoring itself as well as for the influence of monetary policy shocks and economic news on their anchoring.

Based on this set-up, we observe that inflation expectations have become more anchored in the U.S. as changes in short-run inflation expectations induce smaller changes in long-run expectations. Interestingly, the co-movement was substantially reduced not during the Volcker Disinflation, but in the aftermath of the 1996 pre-emptive tightening policy by the Greenspan Fed. This could either indicate that consumers require some time to learn about changes in the conduct of monetary policy and incorporate them into their expectation formation, or that they need several changes in monetary policy to trigger an adjustment.

Furthermore, while the anchoring has increased for the whole population, older cohorts who experienced the high inflation of the 1970s have less anchored expectations on average than those born later as they react more sensitively to shocks signaling higher future inflation. While the younger generation reacts more to recent inflation developments in a symmetric manner, we find that both higher interest rate expectations and news observed on easy money and credit conditions have de-stabilizing effects on the older generation's degree of anchoring. These results indicate that inflation experience might be important not just for the level, but also for the anchoring of inflation expectations, and that consequently high inflation spells (unsustainable monetary policies) might have longer-term consequences. In addition, the older cohorts in our sample also react more

[12] Note that differences between cohorts can only be estimated for the period from 1990 onwards. Therefore, we cannot make any statement about differences across cohorts in the pre-1996 period.

sensitively to the falling inflation rates during the recent financial crisis and the following recession, resulting in a stronger de-anchoring of their long-run inflation expectations especially in recent years.

To sum up, the results tell an intriguing story about the determinants of the anchoring of consumers' inflation expectations over time and across cohorts. The most important message here is certainly that expectations are anchored more firmly since the mid-1990s, as consumers' anchoring on average does not react any more to news on monetary conditions and consumers trust the Federal Reserve in setting the appropriate interest rate. This is so far good news. That said, we would like to highlight two results that might require further attention. First, the observed higher volatility of the degree of anchoring of older cohorts, who experienced the high inflation spells in the 1970s, suggests additional and long-lasting consequences of deviations from price stability. Second, the general increase in the co-movement of consumers' short- and long-run inflation expectations in recent years following the low inflation rates of the financial crisis and the following recession, which is again particularly pronounced for the older cohorts, implies also de-anchoring risks of periods with very low inflation rates and ultra-expansionary monetary policy.

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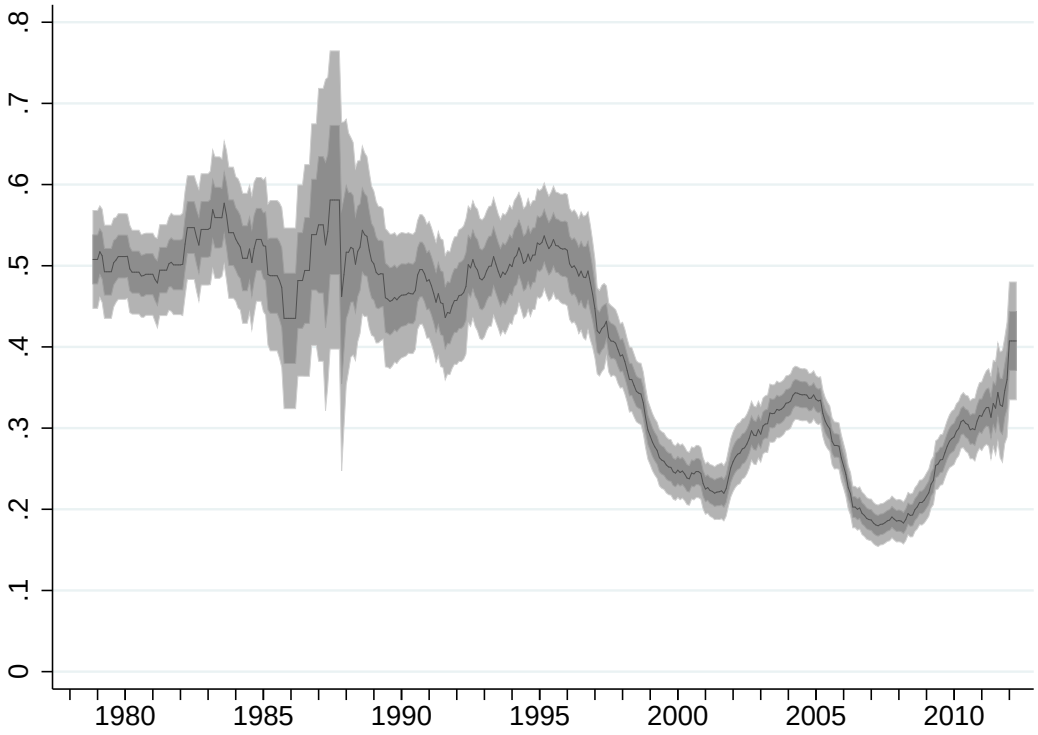
6 Appendix

Figure A.1: Panel Estimation Co-movement of Short- and Long-run Inflation Expectations



Note: The regression coefficient β_t from a panel random effects estimation is plotted, showing the coefficient estimate of a 1% increase in one year ahead inflation expectations on 5-10 years ahead expectations. Shaded areas denote confidence bands at the 5% and the 10% level.

Table A.1: Determinants of the Strength of the Co-movement Across Age Cohorts

	Age $\geq$ 60			Age $\leq$ 40		
	(1)	(2)	(3)	(4)	(5)	(6)
β_{t-1}	0.6866***	0.6825***	0.6064***	0.7405***	0.7395***	0.6968***
	(0.0404)	(0.0363)	(0.0516)	(0.0441)	(0.0456)	(0.0545)
π_{t-1}	0.0003	0.0001	0.0013	0.0017**	0.0019	0.0018
	(0.0007)	(0.0009)	(0.0014)	(0.0008)	(0.0012)	(0.0018)
$\pi_{t-1}^{persistence}$	-0.0207**	-0.0210**	-0.0222***	-0.0027	-0.0026	-0.0041
	(0.0096)	(0.0087)	(0.0086)	(0.0075)	(0.0097)	(0.0117)
balance stat $i_t^{e(1y)}$	0.0924***	0.0962***	0.0909**	0.0301	0.0283	0.0078
	(0.0353)	(0.0320)	(0.0416)	(0.0286)	(0.0330)	(0.0292)
$fedtarget_t$	-0.0037	-0.0039		-0.0096**	-0.0094	
	(0.0050)	(0.0044)		(0.0041)	(0.0060)	
$share\_newsprices\_high_t$	-0.0374	-0.0316	-0.0626	0.1263	0.1193	0.0066
	(0.0919)	(0.1153)	(0.1314)	(0.0810)	(0.0850)	(0.1347)
$share\_newsprices\_low_t$	-0.1713	-0.1739	0.5954	-0.2562	-0.2555	1.0327
	(0.2753)	(0.2423)	(0.7460)	(0.1943)	(0.1805)	(0.8705)
$share\_newsmoney\_easy_t$	2.7108***	2.6861***	3.1905***	-0.5982	-0.5696	-0.6367
	(0.9048)	(0.8470)	(0.9172)	(0.5267)	(0.5415)	(0.6771)
$share\_newsmoney\_tight_t$	0.4453	0.4327	0.8319**	-0.3164*	-0.3036	-0.0960
	(0.3486)	(0.4149)	(0.3569)	(0.1799)	(0.3094)	(0.2030)
i_shock_t		0.0032			-0.0025	
		(0.0038)			(0.0025)	
$alt\_mp\_shock_t$		0.0028			-0.0030	
		(0.0020)			(0.0032)	
$kuttner\_mp\_shock_t$			-0.0001			0.0000
			(0.0001)			(0.0001)
Constant	0.0742**	0.0745**	-0.0427*	0.0837***	0.0841***	0.0403*
	(0.0289)	(0.0297)	(0.0246)	(0.0214)	(0.0280)	(0.0241)
Observations	318	318	213	318	318	213
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.989	0.989	0.987	0.982	0.982	0.981

Note: Bootstrapped standard errors in parentheses. Sample from 1990m10-2017m3. *** p<0.01, ** p<0.05, * p<0.1