JULY 2022
BxWP2022-09

BORDEAUX ECONOMICS WORKING PAPERS
CAHIERS D'ECONOMIE DE BORDEAUX

Navigating the well-being effects of monetary policy: Evidence from the European Central Bank

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Abstract:

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Keywords: Monetary policy, Subjective Well-Being, Survey data, European Central Bank .

JEL: E52, E58, I31

To cite this paper: **Mehdi El Herradi and Aurélien Leroy** (2022), Navigating the well-being effects of monetary policy: Evidence from the European Central Bank, Bordeaux Economics Working Papers, BxWP2022-09

https://ideas.repec.org/p/grt/bdxewp/2022-09.html

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Mehdi El Herradi* Aurélien Leroy †

July 2022

Abstract

This paper assesses whether monetary policy announcements have an impact on households' (subjective) well-being by analysing life satisfaction on the days before and after monetary surprises in Germany. To do so, we use individual-level information on life satisfaction from the German Socio-Economic Panel (SOEP) survey and identify the day on which each answer is submitted to the survey. We also exploit the Euro Area Monetary Policy event study Database (EA-MPD) to obtain daily-level information on European Central Bank (ECB) monetary surprises. Our results show that life satisfaction is significantly affected by monetary policy surprises: tightening surprises decrease life satisfaction, while easing surprises increase it.

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1 Introduction

The decisions and statements of modern central banks have an impact on households' living conditions, yet people's perceptions of monetary policy remain an open question. Over the past decades, many central banks have become more transparent and placed a greater emphasis on communication intended to steer the economy in the direction they desire (Blinder et al., 2008; de Haan and Sturm, 2019; Dincer and Eichengreen, 2007, 2009; Issing, 2019). An illustration of this is the use of forward guidance as a monetary policy tool after the financial crisis of 2008-2009. Much of this increased communication was targeted to experts and financial market participants. However, some central banks have very recently undergone a "communication revolution" (Haldane et al., 2020), aiming to make communication with the general public one of their new priorities.[1]

While there is a developing body of empirical literature on the question of whether households understand central banks' decisions, there is much less empirical work on how monetary policy affects people's sentiments of well-being, regardless of their economic knowledge.[2] The efforts that several public institutions devote to incorporating well-being into public policy design suggests that the relationship between monetary policy and subjective well-being (SWB) should be important to policymakers, as it influences the public perception of central banks.[3]

This paper presents original empirical evidence on the reactions of German people to the monetary policy decisions of the European Central Bank (ECB) using German individual-level survey data covering the 2002-2018 period. One particularity of our paper is that it focuses on people's sentiments rather than their behaviours or quantitative expectations. Specifically, our aim is not to analyse the effects of monetary policy on household spending, investment, or expectations of economic development but to focus on the self-reported well-being of individuals immediately following a monetary policy shock. Put differently, we address the following question: do monetary policy decisions have an impact on people's life satisfaction in the short run?

According to the standard monetary view, changes in monetary policy stance can affect the household sector through the intertemporal substitution channel, whereby lower interest rates encourage households to save less and shift consumption from the future to the present. However, we cannot expect monetary policy to affect people's welfare through this channel alone.

[1] See the Introductory statement of Christine Lagarde, President of the European Central Bank, before the Hearing at the Committee on Economic and Monetary Affairs of the European Parliament, Brussels, 6 February 2020.

[2] Carvalho and Nechio (2014) found that U.S. households seem to be more aware of monetary policy in times of weak labour markets. Based on a survey of Dutch households, van der Cruijsen et al. (2015) argue that a weak desire to be informed and unawareness among respondents about their limited knowledge are barriers to improving the public's general understanding of monetary policy.

[3] Such efforts include, for example, the introduction of the OECD's Better Life Index, which is used to compare well-being across countries.

Nevertheless, the literature has identified several other channels that can impact life satisfaction. These include the cash flow channel, through which lower interest rates can reduce the required repayments of borrowing households with variable-rate debt. This leads to an increase in cash flow and thus in household spending and well-being. In addition, the increase (or expectation of an increase) in employment and wages induced by an expansionary shock may lead to an increase in consumer spending, as indicated by the income channel. Moreover, this expansionary shock would induce a surge in inflation, which has opposing effects on well-being. However, this standard trade-off of macroeconomics is largely in favour of employment for individuals since unemployment depresses well-being more than inflation (Blanchflower et al., 2014; Di Tella and MacCulloch, 2008; Di Tella et al., 2001).

Finally, we also find the wealth channel in the literature, through which the increase in asset prices resulting from decreased interest rates can lead households to spend more and feel happier. In summary, we expect from theory that a decrease in interest rates is associated with an overall increase in SWB, with potentially heterogeneous effects imposed by occupational position and net worth.

A comprehensive analysis of this question, however, requires a microeconomic approach that mobilizes information on SWB and accounts for relevant differences between households.[4] This is why we use data from the German Socio-Economic Panel (SOEP), which is a longitudinal survey conducted in Germany that presents detailed information at the individual and household levels. Three features of this dataset are key: (i) it provides information on life satisfaction at the individual level; (ii) it allows us to control life satisfaction via several microeconomic factors (including employment, earnings, occupation, health, and marital status); and (iii) it allows us to identify the day on which each answer was submitted to the survey.[5] The latter is particularly important for our research question, as it allows us to match the individual survey information with data related to monetary policy.

Identifying a clean measure of monetary policy surprises can be very challenging. In this paper, we rely on the monetary policy event study literature to isolate surprises (Altavilla et al., 2019; Gürkaynak et al., 2005; Gurkaynak, 2005; Gürkaynak et al., 2007; Kuttner, 2001). This body of work identifies monetary surprises from high frequency interest rate changes in a small window around individual policy announcements. By measuring these changes within a sufficiently

[4] Analyses and measures of SWB have received a great deal of interest over the past decade (Clark, 2018). It is commonly agreed that SWB measures are positively correlated with absolute income, the generosity of the welfare state, and life expectancy and negatively correlated with the average number of hours worked, measures of environmental degradation, crime, openness to trade, inflation and unemployment (Di Tella and MacCulloch, 2008).

[5] These features of the data have been recently exploited, for instance, by Akay et al. (2020) to assess the relationship between life satisfaction and global terror.

narrow window of time around a monetary policy announcement, we can be confident that the ECB's decisions are not reactions to asset price movements or other macroeconomic news. Therefore, the observed changes can be considered the surprise component of the monetary policy announcement. We obtain such monetary policy surprises for the Euro area from the Euro Area Monetary Policy Event-Study Database (EA-MPD) compiled by Altavilla et al. (2019). As a result, we have a time series of daily-level monetary surprises, which can be easily merged with the survey data on a daily basis.

In causally assessing the effect of monetary policy surprises on SWB, we face three challenges. First, there is no pure cross-sectional variation in the implementation of monetary policy, which makes it difficult to implement a difference-in-differences approach. As a result, the baseline identification is conducted using the temporal heterogeneity of individuals' exposure to monetary policy surprises. Second, monetary policy surprises consist of a continuous variable with many zeros, and information is available only for the days when an ECB meeting took place. Therefore, the adopted empirical framework is similar to an event study but differs somewhat in that our identification is based on not only the variation in the direction of each surprise (whether positive or negative) but also the intensity of the surprise (continuous variable) rather than on its mere existence (discrete variable). Third, many factors can be correlated with monetary policy surprises. As is usually the case with event studies and regression discontinuity designs (RDDs) conducted over time, we rely on only observations that are sufficiently close in time to the monetary policy events to limit the bias of unobservable confounders. In practice, we isolate the effects of monetary policy surprises by (i) considering a short window centred around the announcement and (ii) assuming that all individuals who react within a given period after the monetary policy announcement are potentially affected by the policy surprise, while those who react within the same period before the announcement are not. We complement this first approach with a difference-in-differences model in which we create a counterfactual based on financial literacy literature. In particular, this literature shows that younger and older people are significantly less financially literate (Atkinson and Messy, 2012; Lusardi et al., 2010, 2014). Based on this observation, we assume that the youngest and oldest individuals in our sample follow monetary policy decisions significantly less closely than other age groups. Thus, we compare life satisfaction before and after monetary policy shocks in the intensively treated group (people aged 25-70) and the control group (people aged under 25 and over 70).

Our results suggest that monetary policy has a significant impact on individuals' life satisfaction regardless of the estimator used. A tightening monetary policy shock reduces life satisfaction, while an easing surprise has the opposite effect. In economic terms, the negative effect on life satisfaction can be expressed as the equivalent of a 4% decrease in household income following

a one standard deviation shock. We also show that the decline in life satisfaction following a tightening monetary policy shock is stronger for young and middle-aged individuals and for those with high incomes. These results are robust to (i) different definition windows of policy announcements, (ii) outliers and major events, (iii) alternative estimators, (iv) different monetary policy shocks and (v) the separation of "pure" monetary policy shock from "pure" central bank information shock. These SWB effects of monetary policy are likely to be channeled through individual perceptions of general macroeconomic conditions that are usually conveyed by the media.

Our contributions to the literature are twofold. First, our empirical framework captures the effects of central bank decisions on people's sentiments. The latter may be a key determinant of household investment and consumption decisions and could therefore affect the transmission of monetary policy. Given the growing interest in the distributional effects of monetary policies over the last decade, our work shows that the effects on household well-being should also be taken into account. Second, the presence of effects of monetary surprises on life satisfaction may indicate that perceptions of monetary policy decisions are not only a matter for experts and financial markets but also a matter for the average man on the street. In this context, a central bank's communication strategy could consider targeting a wider audience or adapting its language to the general public, as its decisions are likely to be disseminated beyond financial markets.

The rest of this paper is structured as follows. Section 2 describes the data. Section 3 provides prima facie evidence on the relationship between monetary policy and life satisfaction and discusses our empirical approach. Section 4 presents the results, while Section 5 concludes the paper.

2 Data

2.1 The German Socio-Economic Panel (SOEP)

To assess how monetary policy decisions affect SWB, we use microlevel data from the German Socio-Economic Panel (SOEP) over the 2002-2018 period. The SOEP is an annual representative survey of persons, households and families in Germany. It was established in 1984 and has a large participant base that includes residents of former West and East Germany, immigrants, and resident foreigners. Individuals within households are surveyed if they are at least 16 years of age. The high degree of stability exhibited by the sample over time is one of the main advantages of this dataset. The topics covered by the questionnaires include household composition, occupational biographies, employment, earnings, health, and environmental behaviour. Our

empirical analysis is conducted based on annual interviews of approximately 41,000 households and approximately 69,000 individuals, nearly half of whom are women.

A common measure of SWB in the existing empirical literature is life satisfaction. As explained by Kahneman and Krueger (2006), life satisfaction data are highly correlated with a variety of economic variables, such as income, consumption and investment. In the SOEP, life satisfaction is continuously assessed with the question "How satisfied are you with your life, all things considered?" Responses to this question are measured on an 11-point scale ranging from 0 (completely dissatisfied) to 10 (completely satisfied). Figure A1 in the Appendix depicts the evolution of life satisfaction over time. The average life satisfaction score is relatively stable at slightly above 7, although it declined during the 2008 financial crisis.

Given that life satisfaction can affect several socioeconomic factors, we exploit the granularity of our dataset and mobilize other variables as controls. These include age, gender, marital status, employment status, educational achievement (i.e., years of schooling), total income, number of people living in the household, and health.

2.2 Monetary policy shocks

In identifying the effects of monetary policy on individuals' life satisfaction, it is crucial to utilize an exogenous measure of monetary policy shocks. In this paper, we rely on the monetary policy event study literature, which uses high-frequency financial data to identify exogenous policy changes that are not anticipated by financial market participants. Then, we use information on individual-specific characteristics to determine the extent to which individuals are affected by such monetary policy shocks. In particular, we exploit household heterogeneity, as SOEP participants are not surveyed in a single month, which allows them to be exposed to different policy shocks within a given survey wave.

Our monetary policy surprises are extracted from the Euro Area Monetary Policy Event-Study Database (EA-MPD) of Altavilla et al. (2019). This database records high-frequency changes in a broad class of asset prices around monetary policy events. Because the size of the monetary event window used is small, these changes might be viewed as the surprise component of the corresponding monetary events.[6] Finally, to identify our monetary policy surprise, we focus on changes in the overnight index with maturities of 1 month, 3 months, 6 months or 1 year and compute the first principal component of these four surprises to obtain a reliable single

[6] Altavilla et al. (2019) distinguish three event windows: the press-release window, the press-conference window and the monetary-event window, including the press-release and the press conference window. In this paper, we exploit only the price changes around the monetary-event window. Therefore, the changes are computed as the difference between the median quote during the interval from 13:25-13:35 before the press release to the median quote for the interval 15:40-15:50 after the press conference.

measure. We use daily data from January 1, 2002 to December 31, 2018, and we include all the scheduled meetings of the ECB that happened throughout this 17-year period.[7] Figure A2 depicts the time series of various overnight index swap (OIS) maturities

Notably, central bank announcement surprises include not only pure monetary surprises but also informational news about the state of the economy, i.e., news on future macroeconomic conditions (Delphic shocks) and future monetary policy shocks (Odyssean shocks). As demonstrated by Jarociński and Karadi (2020) and Cieslak and Schrimpf (2019), a positive comovement between the interest rate and the stock market following monetary policy surprises has been a defining feature of "central bank information shocks". The common explanation for this information component is that the central bank, through its communication, reveals private information about its views on current and future economic conditions.

3 Empirical approach

3.1 Prima-facie evidence

To gain an initial insight into the relationship between SWB and monetary policy, we construct a "clean" measure of SWB and simply plot it against the Euro Overnight Index Average (EONIA) interest rate on the day of the focal interview. Our "clean" measure is obtained by regressing self-reported life satisfaction on individual fixed effects as well as temporal fixed effects (month, year and month*year). For ease of interpretation, we group the 362,488 observations into 20 equally sized bins based on the EONIA interest rate distribution. Figure 1 clearly shows a negative relationship, suggesting that individual welfare is negatively associated with a high interest rate environment.

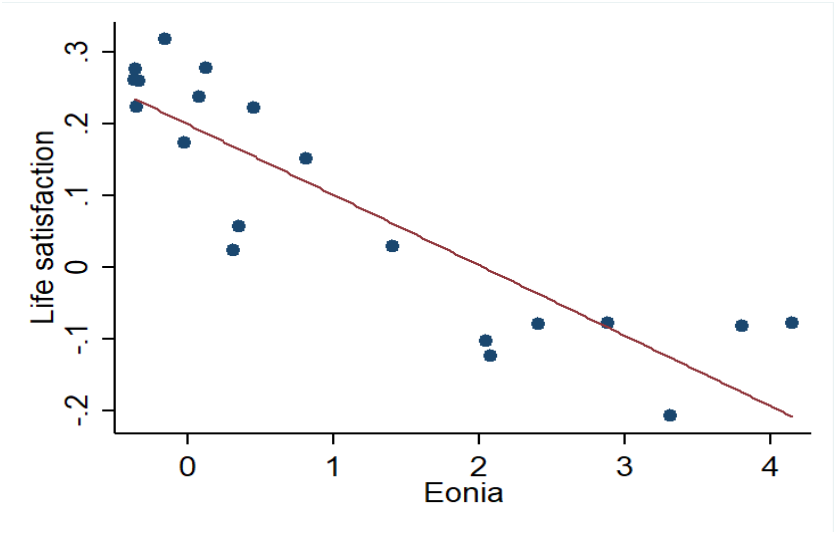
We go further and provide prima facie evidence of a causal link between monetary policy and individuals' life satisfaction. This relationship can be examined simply using a two-step approach in the spirit of Di Tella et al. (2001). In the first stage, a microeconometric OLS life-satisfaction regression is estimated:

$$W_{i,mdt} = \alpha + \gamma X_{i,mdt} + \beta_d + \gamma_m + \theta_t + \varepsilon_{i,mdt} \tag{1}$$

where $W_{i,mdt}$ stands for the (ordinal) response regarding the life satisfaction of individual i on date mdt, with m, d and t referring to the month, the day of the month and the year, respectively. $X_{i,mdt}$ refer to individual time-varying characteristics that are expected to influence

[7] Our identification of monetary policy surprises requires that we start our sample in 2002. Indeed, as shown by Altavilla et al. (2019), from 1999 to the end of 2001, the intraday OIS data used to identify monetary surprises are very noisy.

Figure 1: Subjective well-being and the short-term interest rate



Note: This figure traces the relationship between grouped observations on households' individual life satisfaction and the Eonia interest rate.

life satisfaction at date mdt, while θ_t, γ_m, and β_d represent year, month, and day fixed effects, respectively.

Based on this equation, we compute the quarterly (indexed q) average residual of life satisfaction ($\bar{\varepsilon_{qt}}$). This unexplained aggregated component of individual life satisfaction then enters as a dependent variable into the second equation:

$$\bar{\varepsilon_{qt}} = \alpha + \beta MP_{qt} + \epsilon_{qt} \tag{2}$$

where MP_{qt} corresponds to the monetary policy surprise that is obtained by computing the quarterly average of the EA-MPD monetary policy shocks.

Table 1: SWB and monetary policy surprises - Aggregation of the unexplained SWB component

Life satisfaction	(1)	(2)	(3)	(4)	(5)	(6)
MP surprise	-1.808**	-1.861**	-1.491**	-1.076**	-1.873***	-0.773***
	(0.879)	(0.897)	(0.700)	(0.500)	(0.569)	(0.167)
Life satisfaction lag	No	Yes	Yes	Yes	Yes	Yes
Macro controls	No	No	Yes	Yes	Yes	Yes
Year dummies	No	No	No	Yes	Yes	Yes
Quarter dummies	No	No	No	Yes	Yes	Yes
MP surprise lag	No	No	No	No	Yes	No
Adj. R-squared	0.106	0.107	0.137	0.082	0.163	0.829
No Observations	68	67	67	67	67	67

Note: Cluster-robust standard errors computed at the individual level are reported below the coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 1 presents different specifications of equation 2. Column (1) corresponds to our baseline specification and shows a negative association between life satisfaction and monetary policy surprises. However, this naive equation is subject to autocorrelation in the residuals. Therefore, in column (2), we opt for a dynamic construction of equation 2 with a larger coefficient estimate. Specifically, we find that a monetary surprise of one standard deviation (1.42 basis points) reduces life satisfaction by approximately 2 points. Columns (3) and (4) enrich the model by including more parameters to be estimated. In column (3), the specification includes standard macroeconomic variables –, e.g., output growth, inflation, unemployment – to control for the potential confounding effect of economic conditions, while in column (4), we introduce year and quarter dummies. The results show that the negative effect on life satisfaction continues to hold. Column (5) includes three lags of MP surprises in response to the fact that while monetary surprises are quite orthogonal to macroeconomic news at the daily level, this characteristic becomes more questionable when aggregating the series at the quarterly level. The results presented reject this idea given the stability of the coefficient estimate. Finally, in column (6), we estimate equation 2 using a robust regression to deal with outliers and influential observations. The coefficient estimate confirms the negative effect of monetary policy surprises on life satisfaction, although it is smaller than those of the other specifications.

3.2 Causal assessment

The initial information regarding the relationship between monetary policy and SWB provided in the previous section is suggestive but inconclusive. To strengthen our identification of the causal effect, we propose relating the variation in monetary policy surprises to individual-level

daily variation in life satisfaction. In practice, we take advantage of the granularity of the SOEP data and directly assess the way in which self-reported satisfaction is affected by monetary policy surprises.

For this purpose, we merge each panel observation, i.e., individual * interview date, with the corresponding monetary surprise following the ECB Governing Council announcements. To isolate the effect of each policy announcement, as is commonly done in event study analyses, we consider a short time window around the announcement and compare individuals who respond within a given period after the announcement to those who react during the same given period before the announcement. This means that all panel observations outside the time window and the exact day of the announcement are removed from the empirical estimations, as is standard practice in this field. However, we take one step further than a standard event study design by taking into account the direction and intensity of each surprise in addition to its occurrence. As a result, our identification strategy is based on the temporal variation in the treatment intensity and on a comparison before and after the treatment. The empirical model we estimate has the following general specification:

$$W_{i,mdt} = \alpha + \beta D_{i,mdt} MP_{mdt} + \gamma X_{i,mdt} + \theta_t + \gamma_m + \zeta_d + \varepsilon_{i,mdt} \tag{3}$$

where $W_{i,mdt}$ stands for the (ordinal) response regarding the life satisfaction of individual i on date mdt, with m, d and t referring to the month, the day of the month and the year, respectively. $D_{i,mdt}MP_{mdt}$ is our variable of interest. It is built from the monetary surprises (MP_{mdt}) extracted from the EA-MPD database and a dummy variable ($D_{i,mdt}$) that takes a value of one if the focal response is given within a w-day window after the announcement and zero if the individual responded within the w-day window prior to the announcement. The choice of w is somewhat arbitrary and potentially conducive to biased estimates. This is a key working assumption of our empirical strategy. In choosing w, we are in fact faced with a trade-off: the window must be large enough to include a sufficient number of observations and capture the timing of the diffusion of the focal monetary policy decision, but it should not be so large that it is distorted by other news, as this would lead to a confounding issue and biased estimates. In our baseline specification, w is equal to 7 days. This time window choice specifically accounts for the question of daily effects (i.e., people tend to be happier on Saturdays, for instance) and leaves enough time for the new information to be absorbed by the agents (and conveyed by the media).[8] Of course, we evaluate the robustness of our identification scheme to shorter time windows, in addition to explicitly modelling the daily pattern of our data.[9]

[8] Our choice is relatively consistent with that of ter Ellen et al. (2019), who consider 5 and 10 business days after a monetary policy announcement to capture media reactions.

[9] To make our variable of interest more explicit, let us consider the example of the LTRO program announcement

Our model includes different control variables. $X_{i,mdt}$ refers to individual time-varying characteristics that are expected to influence life satisfaction on the date mdt. We also introduce year (θ_t) and month (γ_m) fixed effects to control for the effects of global shocks (e.g., the 2008-2009 financial crisis) and seasonality in well-being (people are happier during the summer). In the other specifications, $year * month$ fixed effects are also included to control for macroeconomic shocks that are potentially correlated with the monetary policy surprise variable. As seen from equation 3, we do not model unobserved individual heterogeneity because by constructing event windows, we no longer regularly observe individuals: on average, an individual appears only 2.5 times in our empirical estimates. Therefore, our baseline model exploits "between" variation rather than "within" variation. From our perspective, this is not an issue, as we assume that the attrition in the SOEP interviews is random (see infra), which means that pooled estimates and panel estimates should produce similar results. To test the validity of this assumption, we estimate our model using quasi-fixed effects – also known as a correlated random effects model (Mundlak, 1978) – as well as fixed effects on our full sample (without event windows).

Estimating our model by OLS or other linear estimators nevertheless raises some questions. In fact, our dependent variable W_{imdt} is an ordinal proxy of SWB, with 11 points Likert scale. In this case, the choice of a discrete model and an ordered logistic regressions seems more appropriate. Thus, we report the estimates of our baseline model using ordered logistic regression, although we do not expect large differences from the linear model, especially because we have several categories. However, we still consider that the simplicity of interpretation of OLS estimates largely outweighs the modest correction offered by ordered logistic regressions and we therefore decide to use the linear model as a baseline.

As discussed earlier, it is crucial for our identification strategy that interview attrition is random. There is no reason to believe that people would refuse to complete the interview or that the interview schedule would be changed because of the monetary policy surprise. A notable exception could be major monetary policy events, as they often overlap with major economic disturbances. In this particular case, we cannot exclude that individuals might prefer to delay their interviews because of the economic situation, which could bias the estimates.[10] However,

during the Governing Council held on May 7th, 2009. This announcement created an easing monetary policy surprise for financial markets, as the 3-month OIS rate declined by -1.50 basis points during the event. Therefore, as far as this specific event is concerned, our variable of interest, $D_{i,mdt}MP_{mdt}$, is equal to -1.50 for all the individual responses for which the interview date falls between May 8th, 2009 and May 15th, 2009 and zero for all the responses for which the interview date falls between April 30th and May 6th. Furthermore, our event study design leads us to drop all responses provided on the day of an event and those outside the corresponding window. For instance, panel observations on May 16th, 2009 are dropped. The next panel observations that will be considered refer to the ECB council of June 4th, 2009. This means that the temporal observations that follow the observations on May 15th, 2009 theoretically occur 7 days before June 4th, 2009.

[10]To cope with the possibility of nonrandom interview attrition, we estimate a variant of the model in which the

if we assume that individuals most affected by economic shocks are more likely to delay their interview, our estimates would be subject to a downwards bias, thus producing conservative results. To address this concern, we ensure that the participating individuals' characteristics are not significantly different before and after the monetary policy event (see the Appendix).

Another assumption underlying our estimates relates to the absence of confounding factors, i.e., that monetary surprises are orthogonal to other macroeconomics news. As explained in the data section, the way in which monetary surprises are constructed ensures that they are strongly exogenous to other macroeconomic news. Nevertheless, some of our regressions include $year * month$ dummies to capture unobserved macroeconomic shocks that are potentially correlated with both individuals' life satisfaction and monetary policy surprises.

4 Results

4.1 Baseline

Does monetary policy influence SWB? In this section, we answer this question and discuss the results of our event study. Table 3 presents our baseline results obtained by estimating equation 3. We report both the pooled OLS estimates (linear estimation) and the results of ordered logistic regressions (nonlinear estimation). First, specification (1) of the linear model shows a significant negative relationship between MP surprises and life satisfaction, suggesting that a tightening monetary shock reduces individuals' life satisfaction.[11] Inasmuch as our baseline model has symmetric properties, an easing monetary shock mirrors the effect of a tightening shock and increases life satisfaction.

Second, we find that our results are remarkably stable across the different specifications. Indeed, changing the fixed effects included in the linear model in very different ways has only a marginal impact on the coefficient estimates. For example, the inclusion of $year * month$ dummies in specification (2) decreases the effects of interest, but the order of magnitude remains the same, as we find a coefficient of -0.98 against -1.05 in our baseline specification. Interestingly, this mainly suggests that unobserved monthly economic news has no impact on our results. In column (3), we introduce a specification with year, month, and day dummies as well as the number of day windows, and the results confirm the negative impact on life satisfaction. Spec-

most important monetary events are excluded from the empirical analysis.

[11] Note that in all the specifications, standard errors are clustered at the individual level to account for autocorrelation across individuals. In our view, this is important because we do not include individual fixed effects in our baseline regressions. To test the sensitivity of this choice, we alternately cluster standard errors at the month*year, event window, date, and household levels. In all cases, we find that the standard error estimates remain very close to the baseline. To be more precise, the coefficient estimates of specification (1) are significant at the 1% level (or even at the 0.1% level) for all alternatives.

ification (4) estimates equation 3 with individual controls while excluding all time dummies, and specification (5) controls for month*day dummies. The fact that the coefficient estimates remain approximately the same is also reassuring, suggesting that our MP surprise variable is truly exogenous. In specification (6), we adopt a slightly different definition of monetary surprises that does not take into account the intensity of surprises but introduces a variable designating easing shocks as "-1" and tightening shocks as "1". The coefficient estimate still has a negative impact on life satisfaction, but it is significantly smaller than that in the baseline specification.

Third, we also document that our results are robust to the estimation method used. Taking into account the ordinal nature of our dependent variable in the context of an ordered logistic regression leads to the same conclusions, regardless of the choice of model specification, although the displayed coefficients are interpreted differently. In essence, we can state that tightening monetary policy surprises decrease the likelihood that a participant will reply to the survey saying that he or she is "completely satisfied", for instance.[12]

It is fair to ask whether the magnitude of the statistical impact is economically meaningful. Our results show that a one standard deviation increase (1.92) in MP surprises reduces the life satisfaction indicator by 0.024 points. This raw result is, however, difficult to interpret from an economic standpoint. Summary statistics – for example, the mean (7.14) and standard deviation (1.78) – of life satisfaction in our sample can help capture the economic impact but remain largely insufficient. Alternatively, a good way to assess the economic impact is to look for equivalents. Here, we follow Akay et al. (2020) and "monetize" the monetary policy decisions by estimating the equivalent change in individual income stemming from a one standard deviation MP surprise. According to our estimates, a one standard deviation surprise in MP is equivalent to a drop in household income of approximately 4%. We acknowledge that this estimation presents some weaknesses, as household income is potentially endogenous to SWB, i.e., the household income coefficient estimate is subject to an upward bias (Diener and Biswas-Diener, 2002; Gardner and Oswald, 2007). However, it makes sense for us to present the equivalent income, as it helps explain to some extent the accelerator mechanism of monetary policy. Another equivalent we can provide is related to unemployment: the drop caused by a one standard deviation MP surprise is equivalent to approximately 4% of the drop in life satisfaction caused by being unemployed.

[12] The validity of the ordered logit regressions depends on the proportional lines assumption being met. Given that this condition may not be met, we check our results by estimating the generalized ordered logit and find similar results.

We can complete our interpretation of the results by using our ordered logistic regressions and analysing the estimated marginal effects.[13] The findings show that a one-point increase in the surprise effect of monetary policy reduces the probability of answering '8', '9' or '10' on the 11-point life satisfaction scale by 0.17%, 0.11% and 0.04%, respectively. Moreover, the likelihood of reporting a lower satisfaction level increases. In other words, our ordered logistic regression shows that the likelihood of answering "9" is equal to 33.86 when the monetary surprise is equal to zero and the rest of the predictors are equal to their mean; however, it becomes 33.42 when the monetary surprise increases by one standard deviation

[*Insert Table 3 here*]

4.2 Robustness checks

In this subsection, we modify our baseline specification to (i) provide further insights and (ii) ensure that the effect of monetary policy decisions on life satisfaction is not spurious.

4.2.1 Sensitivity

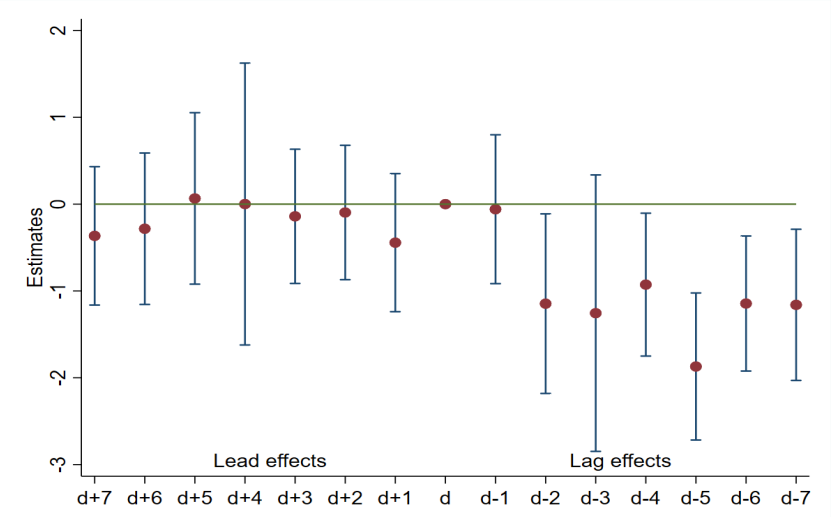
The results of our previous estimates are robust on many dimensions. In our first check, we change the size of the window around the monetary policy announcements. In our baseline estimation, we consider 7 days before and after the focal announcement to analyse the effect of the corresponding monetary policy shock. In Table 4, we report estimates based on shorter windows (5 days, 3 days and 1 day) using the full data sample in which we consider that the monetary policy shocks last until a new monetary policy shock occurs (see columns (1), (2), and (3)). The results show that the findings are largely unaffected when our working assumptions lead to using a full sample or shorter windows, except for the one-day window. Two explanations for this result can be suggested: (i) the specification of our model does not allow for proper consideration of daily effects and the fact that people are systematically happier on Fridays than on Wednesdays and (ii) people do not react directly to an announcement but need time to absorb the new information. The fact that "most people are not obsessed with the central bank" (Blinder and Svensson, 2015) seems to be widely accepted and could explain why relevant information is transmitted by the media to "normal people" in a short period of time, as recent evidence suggests. In addition, column (4) implements a placebo test that lags the policy surprises by one week and reassuringly has no impact on life satisfaction. Specifications (5) and (6) both consider the 7-day impact after each announcement, but while the first includes all the observations, the latter is limited to observations within the 7-day impact period. The obtained coefficients are consistent with the baseline results. The last column of Table 4 transforms the

[13] We report the estimates of the marginal effects in Table A1.

monetary policy surprise into a continuous variable, thus assuming that its effect lasts until a new monetary policy announcement is made. The effect on life satisfaction is smaller than half the size of that in the baseline estimate.

[*Insert Table 4 here*]

Figure 2: Decomposition of the event window



Note: The vertical axis shows event-study estimates using our baseline model in which we decompose the week after the announcement into 7 variables and include lead effects. We report 95% confidence interval around point estimates obtained with robust standard errors estimates.

Second, to further assess the robustness of our identification strategy, we implement an event-study design using equation 3, in which we decompose the 7-day period around each monetary policy announcement. Specifically, both event lags (i.e., pre-event period) and leads (i.e., post-event period) are estimated to provide a visual representation of each monetary surprise's causal impact. The event study lag and lead coefficients, along with their confidence intervals, are plotted in Figure 2. The fact that the coefficient estimates for the 7-day post-announcement period (i.e., lead effects) are not significant confirms the absence of parallel trends in the pretreatment period and reinforces the validity of our monetary surprises.

Third, the sensitivity of our results to major events and outliers is also assessed in Table 5. In column (1), we present estimates with the monetary policy shocks winsorized at the 5% level; then, we estimate our model by excluding policy events for which we have fewer than 100 or 1000 observations (columns 2 and 3, respectively). We also exclude observations with standardized residuals greater than 1.96 (column (4)) and those with a Cook's distance greater than a common rule-of-thumb threshold (column (5)).[14] Finally, column (6) presents estimates using the robust estimators of Hubert (1964). In all cases, the results are very similar, indicating that our conclusions are not driven by outliers or major events.

[14]Four divided by the number of observations.

[*Insert Table 5 here*]

Fourth, in Table 6, we present alternative estimators that model individual unobserved heterogeneity. Column (1) shows estimates from Mundlak's quasi-fixed effects estimator, which explores both the within and between variation in the data, while columns (2) and (3) present fixed and random effects estimates, respectively, based on the full sample. The coefficients of interest are still significant, but they are approximately twice as small. Column (4) introduces the lagged term of satisfaction into the pooled OLS regression, and the coefficient estimate remains intact. In columns (5) and (6), we take into consideration both the ordinal nature of our dependent variable and individual heterogeneity. First, we use a panel random-effects ordered logit model that includes the means of the time-variant control variables (in the spirit of quasi-fixed effects). Second, we use a "blow and cluster" (BUC) fixed-effects ordered logit model *à la* Baetschmann et al. (2015). The results are broadly in line with our baseline findings.

[*Insert Table 6 here*]

From the outset, we have considered intraday changes in the 3-month Euribor price around ECB policy announcements as our measure of monetary policy shocks. Here, we test whether our results hold when other intraday asset price changes are used to define our policy shock. A wide range of assets are tested (OIS 1M, OIS 3M, OIS 6M, OIS 12M and Euro Stoxx50) in Table 7. While the coefficient estimates using the OIS at different maturities are similar to those of the baseline results, the one using the Euro Stoxx50 is not statistically significant.

[*Insert Table 7 here*]

4.2.2 Pure monetary policy surprises

Regarding Euro Stoxx50 surprises, we find that they have no effect on life satisfaction, while one might expect a positive impact. One way to explain this is that stock markets do not systematically react to ECB communication in the opposite direction of short-term rates. Indeed, as shown in Figure 3, a communication announcing an interest rate cut could signal bad news about macroeconomic conditions, inducing a decrease in stock market valuation, but it could also be good news because it means a more accommodating monetary policy. This example points out that ECB announcements reveal information not only about policy stance but also about ECB assessments of the economic outlook.

In the literature, this refers to the distinction between Delphic and Odyssean monetary policy shocks (Andrade and Ferroni, 2021).[15] As a robustness check, we follow the literature that

[15]Delphic shocks primarily convey news about the state of the economy and lead to positive comovement between short-term interest rates and stock markets, while comovement related to Odyssean shocks is negative, which

Figure 3: OIS Surprises and Stoxx50 Surprises

Note: This figure traces the relationship between our monetary policy surprise obtained from OIS surprises and surprises in the Stoxx50 around the monetary event.

separates monetary policy shocks from contemporaneous information shocks: the former are identified by negative comovement between changes in interest rates and stock prices, while the latter are identified when interest rates and stock prices comove positively. Specifically, we follow Jarociński and Karadi (2020) and use "pure" monetary policy shocks, which are purged from the impact of central bank information shocks. The results presented in Table 8 replicate the baseline specifications reported in Table 3 and show strong consistency with the baseline results: pure monetary policy shocks significantly decrease individual life satisfaction.

[*Insert Table 8 here*]

4.2.3 Google Trends: A new way to measure shock impact

Thus far, we have assumed that the reactions of central banks to monetary policy decisions are related to the intensity of the initial reactions of high-frequency OIS. Implicitly, it is assumed that the more significant a surprise is, the more the corresponding monetary policy decisions will resonate with the general public. However, is this truly the case? Before answering this question, we need to highlight the channel through which high-frequency surprises in OIS markets can be transmitted to individuals. This is important because we agree with Kumar et al. (2015) and Blinder and Svensson (2015) that most people are not obsessed with the central bank and therefore the general public does not consciously listen to the ECB messages. However, this does not mean that the general public does not receive any information about the ECB's decisions. The media transmits information about monetary policy, and our assumption is that the (absolute) strength of a surprise has an impact on the degree to which this information is

are pure monetary policy shocks.

disseminated.[16]

This multistep causal chain cannot be identified in our baseline reduced-form model. To convince our readers of the plausibility of our assumptions, we use Google Trends, which provides information on the relative evolution of internet search queries over time. From these data, we can determine whether the search traffic for individual ECB-related terms increases on the day of monetary policy communication and test whether this is related to the absolute strength of a surprise, i.e., Do larger high-frequency surprises induce higher Google search volume related to the ECB? This second point would support the spread of monetary policy surprises to the public sphere.

Table 2: Monetary events and Google Trends searches

	"EZB"		"EZB2"	
Sample - Monetary event	Yes	No	Yes	No
Index mean	15.939	6.926	6.382	-.205
Index standard-deviation	6.772	4.487	6.751	4.252
Nb. Obs	148	4,601	148	4,601

Note: "EZB" refers to the Google Trends search volume index for the term "EZB" ("Europäische Zentralbank") from Germany, while "EZB2" is a version of "EZB" purged from the day-of-the-week dummies.

For our analysis, we use the daily Google Trends search volume index for the term "EZB" ("Europäische Zentralbank") from Germany. In doing so, we can verify that ECB meetings increase the volume of research conducted. Table 2 illustrates this by comparing the average index on the day of an ECB meeting with those of all other days from January 1st, 2002 to December 31, 2018. In the same vein, we compare the two samples based on a "clean" index from which we first purge the index pertaining to day-of-week effects. As expected, we observe a significant positive difference between the means of the two samples. We then go a step further and provide in Figure 4 a scatter-plot of the relationship between the absolute values of the monetary policy surprises and the "EZB" search query volume. We observe a positive relationship between the two variables. In our view, this indicates that the intensity of the surprises obtained from the intraday financial market data is important on a broader level.

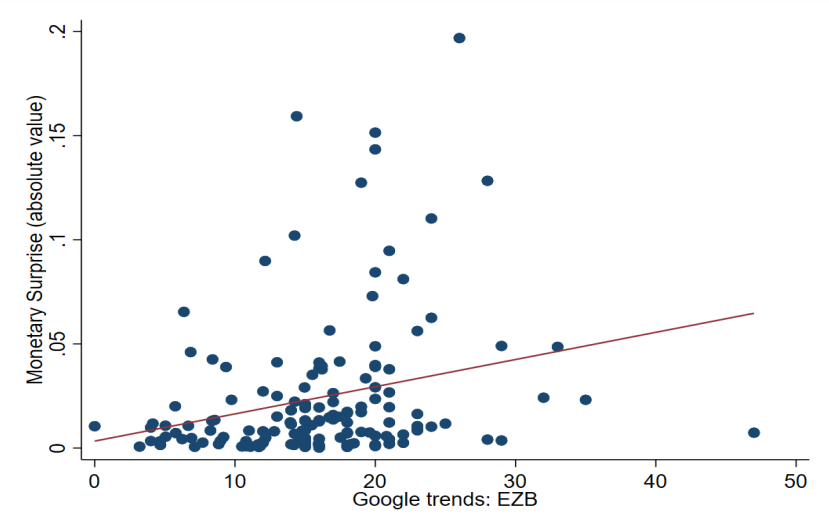
Thus, our Google Trends index seems well suited as a proxy for the intensity of monetary policy shocks. Moreover, it has a comparative advantage over OIS surprises: each day of the event week has a different value, allowing the intensity of the shock to fade or be nonlinear over the week. However, this also introduces a drawback: Google Trend data are potentially

[16]The fact that high-frequency monetary surprises can have an impact on short-term welfare is consistent with the results of Jarociński and Karadi (2020), who show in a structural monthly VAR that these surprises induce a contemporaneous decline in real GDP.

endogenous.

To build our new shock, we rely on our Google index and on OIS surprises. Indeed, we need the latter to distinguish between tightening and easing shocks and subsequently to transform our Google index accordingly. In practice, we change the sign of the Google index to be negative in the case of easing shocks. Apart from our MP surprise variable, the model we estimate in this section is the same as our baseline model. Table 9 reports the results with our new MP surprise variable. All the specifications show a negative relationship between monetary surprises and life satisfaction, corroborating the results of our baseline approach. Therefore, our findings suggest that the more a monetary event arouses public interest, the more strongly SWB will respond.

Figure 4: HFI Monetary Policy Surprises and Google Trends



Note: This figure traces the relationship between our monetary policy surprise obtained from high-frequency financial data and the google trend search volume index for the term "EZB" ("Europäische Zentralbank") from the Germany. The index is based on internet search queries scaled to the maximum search traffic (represented as 100) during the period from January 2002 to December 2018 in Germany.

[*Insert Table 9 here*]

4.2.4 Are the effects heterogeneous?

In Table 10, we explore different sources of heterogeneity in our baseline results. First, in column (1), we examine whether the effects are symmetric according to the sign of the surprises and find that easing and tightening shocks have opposite effects on life satisfaction: tightening surprises reduce an individual's life satisfaction, while easing ones increase it. However, the economic effects of a one standard deviation surprise are stronger for tightening shocks than for easing surprises. Another useful check involves testing the heterogeneity of estimates over time. Thus, we compare the effects of monetary policy events before and after 2009. This serves two purposes: we can (i) analyse whether the results are driven by unconventional monetary

policy announcements and (ii) explore whether the ECB's messages increase in impact over time. The results in column (2) show a decrease in the coefficient estimates over time, which is consistent with the downward trend in the magnitude of the surprises. Thus, the impact of monetary policy announcements on welfare has been relatively constant since 2003. We also explore age and income heterogeneity to analyse how the effects of monetary policy on life satisfaction differ across age categories and income quantiles in columns (3) and (4). First, the evidence shows that the impact of monetary policy surprises on life satisfaction is significant only for young and middle-aged individuals. Second, regarding income heterogeneity, the findings document that tightening monetary policy shocks have no significant effects on low-income individuals, while the negative effect is strongest for the middle class. Finally, we analyse whether the effect of monetary policy shocks on life satisfaction differs between men and women: the coefficient presented in column (5) shows that the decrease in life satisfaction is stronger for women.

[*Insert Table 10 here*]

4.2.5 A difference-in-difference design

In using a difference-in-difference design, we aim to clean up our estimates of gross variation in life satisfaction around the monetary policy events through changes in a counterfactual. Finding a good counterfactual is nevertheless very challenging in the context of our research question because any individual can be affected by monetary policy events. To isolate counterfactuals and estimate a difference-in-difference model, our strategy builds on the literature on financial literacy, which shows that financial knowledge is influenced by sociodemographic factors such as age. For instance, Lusardi et al. (2010) provide evidence that young people are significantly less literate, but other contributions show that literacy is also relatively low among older people (Atkinson and Messy, 2012; Lusardi et al., 2014). Based on this hump-shaped model of financial literacy, we assume that younger and older people follow monetary policy decisions less than others. Therefore, we compare life satisfaction before and after policy shocks in the intensively treated group (people aged 25-70) and the control group (people aged under 25 and over 70). The results for the linear and nonlinear estimates are reported in Table 11, and they continue to show strong consistency with the baseline findings.

[*Insert Tables 11 here*]

4.2.6 What are the channels?

Finally, we attempt to analyse certain transmission mechanisms of the impact of monetary policy surprises on individual life satisfaction. We distinguish two potential explanations: (i)

individuals anticipate that easing shocks will improve their own economic conditions (direct effect), and (ii) individuals expect a positive effect on the economy in general (indirect effect). For our empirical analysis, to investigate these two explanations, we rely on the question "How concerned are you?" In column (1) of Table 12, we test the effect of monetary policy surprises on the intensity of the respondents' concern (Very concerned/Somewhat concerned/Not concerned at all) about individual economic conditions. We observe that a monetary policy surprise significantly deteriorates individuals' views about the economy in general. People's reactions are consistent with the fact that these surprises lead to contractions in employment and GDP at the aggregate level (Jarociński and Karadi, 2020). This shows that individuals have good perceptions of economic development, probably not in quantitative terms but at least in qualitative terms. In contrast, in column (2), we find that the surprises do not affect individuals' degree of concern about their own economic conditions. In short, the average individual believes that he or she is insulated against macroeconomic shocks because there is no "fear" effect of deteriorating economic conditions. In columns (3) and (4), we employ individuals' responses on how they think they will feel in five years and one year, respectively. These variables are then regressed on monetary policy surprises. The results show that tightening surprises reduce future perceptions of life satisfaction and underline that this negative effect is stronger for the degree of life satisfaction expected in one year. This highlights the role of optimism and expectation in the transmission of monetary policy to life satisfaction and may also have implications for investment and consumption decisions.

[*Insert Table 12 here*]

5 Conclusion

This paper sought to assess the effects of monetary policy on the SWB of German people over the 2002-2018 period. The motivations for studying this issue are twofold. First, shifts in individual well-being as a result of monetary policy decisions can affect investment and consumption decisions, thus having important effects on the economy. Second, several central banks are revisiting their communication strategies to target audiences beyond financial market participants; thus, they need to understand the welfare effects of monetary policy.

In this context, we first mobilize individual data on life satisfaction from the German Socio-Economic Panel (SOEP), which one of the most established household surveys in the world. Second, the individual data are combined with the Euro Area Monetary Policy Event-Study Database (EA-MPD). The latter maps ECB policy communication into yield curve changes and study the information flow on policy dates. We specifically take advantage of information avail-

ability on individuals' interview day to exploit the heterogeneous exposure of participants to different monetary policy shocks.

Our empirical framework for estimating the causal effect of monetary policy on self-reported life satisfaction can be seen as a variant of event study analyses. Specifically, (i) we match panel observations with the corresponding monetary surprises following the ECB Governing Council announcements and (ii) consider a 7-day window around monetary policy announcements to compare individuals who respond within a given period after the announcements to those who react in the same period before the announcements. Our identification strategy is further strengthened in that it is based on not only the temporal variation in the treatment but also its intensity.

Our results suggest that monetary policy shocks have a significant impact on SWB: tightening surprises reduce self-reported life satisfaction, while easing surprises increase the likelihood of answering '8', '9' or '10' on the 11-point life satisfaction scale. This causal assessment is valid under both the OLS linear estimator and the nonlinear ordered logit estimator. The robustness of our main findings is assessed in several ways. First, we document that changing the length of the time window around the policy announcements does not affect the coefficient estimates. Second, the findings remain intact when (i) major events and outliers are excluded, (ii) alternative estimators are introduced, and (iii) monetary surprises are proxied with different indicators. Third, the separation of monetary policy shocks from contemporary information shocks confirms the negative impact on life satisfaction. Fourth, adopting a difference-in-differences framework based on the age categorization counterfactual yields similar results. We further document that the effect of a tightening shock on life satisfaction is stronger than that of an easing shock, while the impact of monetary surprises is not significant for (i) older or (ii) low-income individuals.

6 Main tables

Table 3: SWB and monetary policy surprises - Baseline results

Life satisfaction	(1)	(2)	(3)	(4)	(5)	(6)
Linear estimation: OLS						
MP surprise	-1.054***	-0.988***	-0.722***	-0.993***	-1.004***	
	(0.182)	(0.260)	(0.249)	(0.174)	(0.192)	
MP surprise (-1/1)						-0.024***
						(0.006)
Adj. R-squared	0.260	0.262	0.262	0.250	0.259	0.260
Observations	142839	142839	142839	142839	142839	142839
Non-linear estimation: Ordered LOGIT						
MP surprise	-1.275***	-1.123***	-0.783***	-1.255***	-1.275***	
	(0.210)	(0.302)	(0.290)	(0.200)	(0.210)	
MP surprise (-1/1)						-0.026***
						(0.007)
Pseudo R-squared	0.079	0.080	0.080	0.075	0.079	0.079
Observations	142839	142839	142839	142839	142839	142839
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	No	Yes	Yes
Month dummies	Yes	Yes	Yes	No	Yes	Yes
Day dummies	Yes	Yes	Yes	No	Yes	Yes
Year*Month	No	Yes	No	No	No	No
Window dummies	No	No	Yes	No	No	No
Month*Day	No	No	No	No	Yes	No

Note: All the models control for individual characteristics (household income, marital status, activity status, education, age, gender and health). Variant (1) is our baseline and includes day, month and year dummies ; (2) extends (1) by controlling for month*year effects ; (3) extends (1) by controlling for window-event dummies ; (4) excludes all time dummies ; (5) introduces year and day*month dummies; and finally, (6) does not consider surprise intensity and codes easing shocks as "-1" and tightening shocks as "1". Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 4: SWB and monetary policy surprises - Different windows

Life satisfaction	(1)	(2)	(3)	(4)	(5)	(6)	(7)
5 days window	-1.061***						
	(0.225)						
3 days window		-0.736**					
		(0.324)					
1 day window			0.068				
			(0.460)				
Falsification test				-0.000			
				(0.000)			
7 days impact - All obs.					-0.902***		
					(0.176)		
7 days impact - Restricted obs.						-0.967***	
						(0.196)	
Continuous							-0.443***
							(0.090)
Adj. R-squared	0.262	0.262	0.263	0.255	0.255	0.259	0.255
Observations	97427	60205	23364	348802	348802	72782	336791

Note: All the models control for individual characteristics (household income, marital status, education, activity status, age, gender and health) and include day, month and year dummies. Variants (1), (2) and (3) report estimates based on 5-day, 3-day and 1-day periods after and before the focal monetary policy announcement, respectively ; (4) is a placebo test in which we lag the MP surprise by one week; (5) considers a 7-day impact after the announcement that we compare with all the observations ; (6) restricts the observations to a 7-day impact period ; and finally, (7) transforms each MP surprise into a continuous surprise by assuming that the surprise matters until a new monetary policy announcement. Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 5: SWB and monetary policy surprises - Major events and outliers

Life satisfaction	(1)	(2)	(3)	(4)	(5)	(6)
MP surprise	-2.003***	-1.049***	-0.925***	-1.008***	-0.955***	-0.980***
	(0.386)	(0.182)	(0.210)	(0.152)	(0.148)	(0.176)
Adj. R-squared	0.260	0.260	0.270	0.329	0.324	0.272
Observations	142839	141923	115827	135008	134669	142839

Note: All the models control for individual characteristics (household income, marital status, activity status, education, age, gender and health) and include day, month and year dummies. Variant (1) applies a 95% winsorisation to the MP surprises ; (2) and (3) exclude monetary policy events for which the event-window includes fewer than 100 or 1000 individuals, respectively; (4) reports estimates for which we exclude observations with a standardized residual greater than 1.96; (5) excludes observations with a Cook's distance above a common rule-of-thumb threshold; and finally, (6) presents estimates using the robust estimators of Hubert (1964). Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 6: SWB and monetary policy surprises - Alternative estimators

Life satisfaction	(1)	(2)	(3)	(4)	(5)	(6)
MP surprise	-0.673***	-0.517***	-0.726***	-0.710***	-1.215***	-0.893***
	(0.155)	(0.165)	(0.157)	(0.170)	(0.235)	(0.294)
Adj. R-squared	0.284	0.076		0.439		
Observations	142839	142839	142839	119937	142839	300530

Note: All the models control for individual characteristics (household income, marital status, education, activity status, age, gender and health) and include day, month and year dummies. Variants (1), (2) and (3) use Mundlak's quasi-fixed effects, fixed effects and random effects estimators, respectively ; (4) specifies a dynamic model estimated with pooled OLS; and finally, (5) and (6) are ordered logistic regressions taking into account individual heterogeneity by using random-effects and blow-and-cluster (BUC) fixed-effects estimators, respectively. Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 7: SWB and monetary policy surprises - Different shocks

Life satisfaction	(1)	(2)	(3)	(4)	(5)
1M OIS	-1.211***				
	(0.338)				
3M OIS		-1.152***			
		(0.244)			
6M OIS			-1.152***		
			(0.194)		
1Y OIS				-0.912***	
				(0.150)	
STOXX 50					0.002
					(0.011)
Adj. R-squared	0.260	0.260	0.260	0.260	0.260
Observations	142839	142839	142839	142839	142839

Note: Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. Individual controls (household income, marital status, education, activity status, age, gender and health) are not reported. The specifications also include year, month and year dummies. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 8: SWB and monetary policy surprises - Pure monetary policy surprise

Life satisfaction	(1)	(2)	(3)	(4)	(5)	(6)
Pure monetary surprise	-0.885***	-0.826**	-0.681**	-1.092***	-0.845***	
	(0.220)	(0.322)	(0.294)	(0.238)	(0.230)	
Pure monetary surprise (-1/1)						-0.028***
						(0.009)
Adj. R-squared	0.260	0.262	0.262	0.250	0.259	0.260
Observations	142839	142839	142839	142839	142839	142839

Note: All the models control for individual characteristics (household income, marital status, activity status, education, age, gender and health) and define "pure monetary surprises" according to Jarociński and Karadi (2020). Variant (1) includes day, month and year dummies ; (2) extends (1) by controlling for month*year effects ; (3) extends (1) by controlling for window-event dummies ; (4) excludes all time dummies ; (5) introduces year and day*month dummies; and finally, (6) does not consider surprise intensity and codes easing shocks as "-1" and tightening shocks as "1". Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 9: SWB and monetary policy surprises - Diffusion of MP surprise

Life satisfaction	(1)	(2)	(3)	(4)	(5)
MP surprise diffusion	-0.002***	-0.002**	-0.002*	0.000	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Adj. R-squared	0.262	0.264	0.264	0.252	0.263
Observations	90395	90395	90395	90395	90395

Note: All the models control for individual characteristics (household income, marital status, activity status, education, age, gender and health) and define "pure monetary surprises" according to Jarociński and Karadi (2020). Variant (1) includes day, month and year dummies ; (2) extends (1) by controlling for month*year effects ; (3) extends (1) by controlling for window-event dummies ; (4) excludes all time dummies; and finally, (5) introduces year and day*month dummies. Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 10: SWB and monetary policy surprises - Heterogeneity

Life satisfaction	(1)	(2)	(3) - Q1	(3) - Q2	(3) - Q3	(3) - Q4	(3) - Q5	(4) - Q1	(4) - Q2	(4) - Q3	(4) - Q4	(5)
Easing surprise	0.934**											
	(0.398)											
Tightening surprise	-1.031***											
	(0.343)											
After 2009		-0.895***										
		(0.226)										
Before 2009		-1.345***										
		(0.309)										
Age heterogeneity			0.290	-1.138***	-1.420***	-1.006***	0.020					
			(0.997)	(0.361)	(0.319)	(0.356)	(0.500)					
Income heterogeneity								-0.051	-1.391***	-1.502***	-0.822***	
								(0.639)	(0.409)	(0.331)	(0.274)	
Women												-1.205***
												(0.262)
Adj. R-squared	0.262	0.260	0.159	0.216	0.293	0.283	0.291	0.223	0.226	0.227	0.210	0.252
Observations	142839	142839	6137	34335	46506	34538	21365	21486	32257	39930	49166	75305

Note: Column (1) analyzes the effects of tightening and easing surprises on life satisfaction. Column (2) compares the effects of monetary policy events before and after 2009. Columns (3) and (4) examine the heterogeneity of monetary policy shocks at different age and income levels. Column (5) estimates the impact of monetary policy on women's life satisfaction. Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. Individual controls (household income, marital status, education, activity status, age and health) are not reported.

Table 11: SWB and monetary policy surprises: DID results with age categorisation

Life satisfaction	(1)	(2)	(3)	(4)	(5)
Linear estimation: OLS					
DID - MP surprise	-1.166**	-1.179**	-1.275***	-1.480***	-1.188***
	(0.458)	(0.460)	(0.460)	(0.459)	(0.460)
Adj. R-squared	0.262	0.263	0.263	0.252	0.261
Observations	142839	142839	142839	142839	142839
Non-linear estimation: Ordered LOGIT					
DID - MP surprise	-1.207**	-1.268**	-1.397***	-1.555***	-1.207**
	(0.538)	(0.541)	(0.541)	(0.538)	(0.538)
Pseudo R-squared	0.080	0.081	0.081	0.075	0.080
Observations	142839	142839	142839	142839	142839
Year dummies	Yes	Yes	No	Yes	Yes
Month dummies	Yes	Yes	No	Yes	Yes
Day dummies	No	No	No	Yes	Yes
Year*Month	No	Yes	No	No	No
Month*Day	No	No	No	No	Yes

Note: All the models control for individual characteristics (household income, marital status, education, activity status, age, gender and health). Variant (1) is our baseline and includes month and year dummies ; (2) includes month*year dummies; (3) excludes time dummies ; (4) extends (1) by controlling for day effects; and finally, (5) introduces day*month dummies. Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 12: SWB and monetary policy surprises - Channels

	Econ conditions	Fin conditions	Life satisfaction 5Y	Life satisfaction 1Y
MP surprise	-0.648***	-0.022	-0.614**	-2.088***
	(0.237)	(0.231)	(0.253)	(0.554)
Adj. R-squared			0.257	0.250
Observations	137562	143860	64565	23615

Note: Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. Individual controls (household income, marital status, activity status, education, age, gender and health) are not reported. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

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Appendix

Table A1: SWB and monetary policy surprises: Marginal effects of the ordered logit model

0	0.003***	0.023**	0.002***
	(0.000)	(0.009)	(0.000)
1	0.003***	0.025***	0.002***
	(0.001)	(0.009)	(0.000)
2	0.009***	0.068***	0.007***
	(0.001)	(0.023)	(0.000)
3	0.020***	0.127***	0.016***
	(0.003)	(0.033)	(0.000)
4	0.028***	0.138***	0.024***
	(0.005)	(0.021)	(0.000)
5	0.101***	0.286***	0.099***
	(0.017)	(0.006)	(0.001)
6	0.085***	0.136***	0.114***
	(0.014)	(0.026)	(0.001)
7	0.070***	0.123***	0.260***
	(0.012)	(0.036)	(0.001)
8	-0.169***	0.061***	0.340***
	(0.028)	(0.022)	(0.001)
9	-0.108***	0.011**	0.102***
	(0.018)	(0.004)	(0.001)
10	-0.042***	0.003**	0.034***
	(0.007)	(0.001)	(0.000)

Note:
Cluster-robust standard errors computed at the individual level are reported below their coefficient estimates. *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Figure A1: Life satisfaction - Sample average

Source: SOEP data, own calculations

Table A2: Summary statistics - Mean values

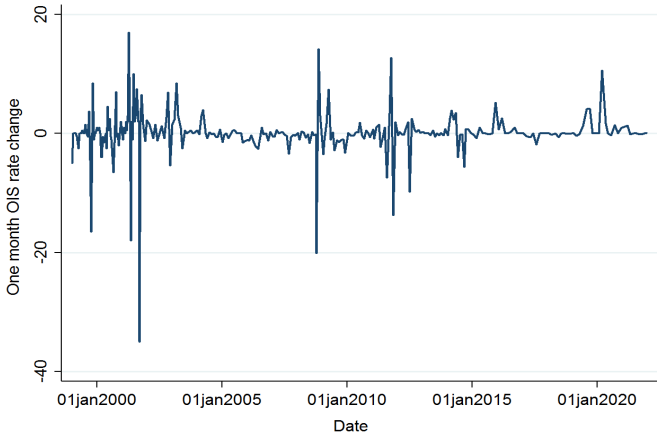
Variables	Mean	Std. Dev.
Life satisfaction	7.09	1.78
Monthly income	2877	2044.75
Age	49.5	16.48
Household size	3.18	1.64
Gender	0.72	0.44
Unemployed	0.07	0.25
Married	0.61	0.48
Years of education	11.95	3.35
Observations	120,400	

Notes: SOEP data, own calculations

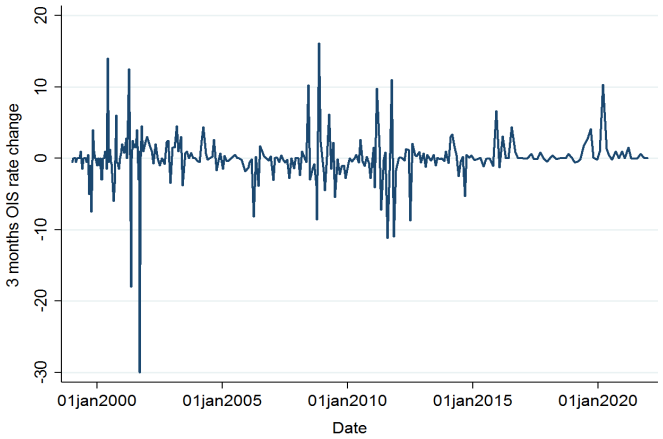
Figure A2: Policy news shocks, 2002–2020

(a) 1 Week OIS rate change

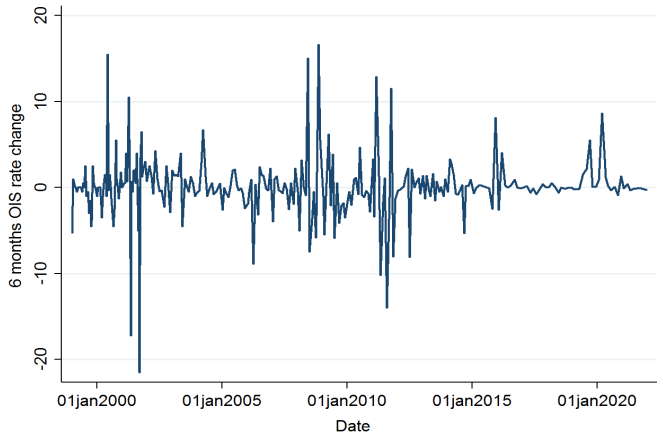
(b) 1 Month OIS rate change



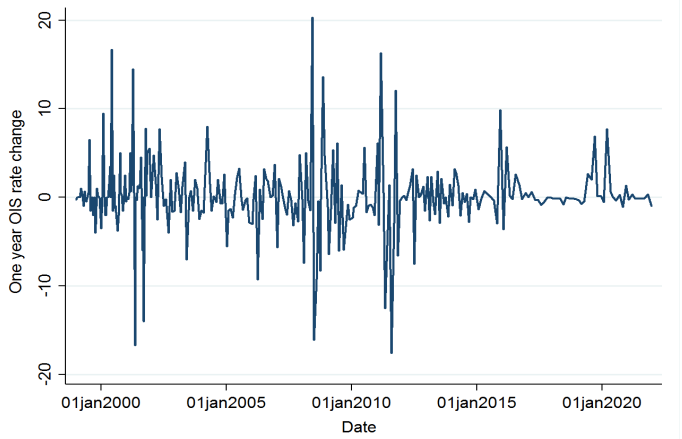
(c) 3 Months OIS rate change



(d) 6 Months OIS rate change



(e) 1 Year OIS rate change



Note: The Euro Area Monetary Policy Event-Study Database (EA-MPD)

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