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Media Perception of Fed Chair's Overconfidence and Market Expectations*

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Abstract

This paper aims to assess the impact of media perception of Fed chair's overconfidence on market expectations. We first use a media-based proxy to compute a measure of Fed chair's overconfidence for the period 1999M01-2017M07, the overconfidence indicator. The overconfidence indicator provides a measure of the *perceived* overconfidence of the Fed chair by the media, and thus, by financial market participants. We relate this variable to inflation and unemployment expectations of market participants. Our results show that an overconfident Fed chair is associated with higher inflation expectations and lower unemployment expectations. These findings are robust to (i) the macroeconomic forecasts used to extract the exogenous component of the media-based proxy reflecting Fed chair's overconfidence, (ii) different measures of the media-based proxy used to quantify Fed chair's overconfidence and (iii) different measures of inflation expectations. These findings shed some new light on the impact of central bankers' personality on market expectations, and thus, on the effectiveness of their monetary policy decisions.

Keywords: Fed Chair, Overconfidence, Monetary Policy, Media.

JEL classification: E52, E58

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I Introduction

The recent global financial crisis (GFC) has pushed central bank governors at the center stage and made their leadership even more important than before. This is exemplified by the aura acquired by the heads of central banks: Mario Draghi, the current president of the European Central Bank (ECB) (2011 -), is often referred as *super Mario* by the media[1] and Ben Bernanke, the former president of the Federal Reserve (Fed) (2006-2014), was named TIME's 2009 Person of the Year. The appointment of Raghuram Rajam and Mark Carney as governors of the Reserve Bank of India (2013 - 2016) and the Bank of England (2013 -) also show the importance of having personalities depicted as successful and competent at the head of central banks. Following this line of thought, Neuenkirch and Tillman (2016) suggest that central bankers' personality is crucial for the effectiveness of the (un)conventional policy measures. They find that superstar central bankers achieve a lower inflation rate and a better output-inflation trade-off.[2] This result is consistent with the claim of Berger et al. (2011), who argue that the success of a policy decision depends on the ability of policy-makers to convince that the decision was appropriate. This ability may hinge on the personality of the central bankers who implement the policy decision.

Even though central bankers' personality comprises several dimensions, a specific trait that may characterize them and affect the effectiveness of their policy decisions is overconfidence. The psychology literature finds that overconfident policy-makers are characterized by optimism, which is linked to the "better-than-average" effect, where individuals tend to overestimate their ability relative to average, and the "illusion of control", where individuals believe they have greater control over uncertain events (Larwood and Whittaker, 1977; Weinstein, 1980; Weinstein and Klein, 2002). These principles describe overconfident policy-makers who overestimate their own skills and are therefore too optimistic about the outcomes of their decisions. As an illustration, Claussen et al. (2012) find that overconfident policy-makers explain the features characterizing monetary policy decisions nowadays, such as those of the U.S. Federal Open Market Committee (FOMC): (i) decisions are made by a committee, (ii) the committee members often disagree (see Meade, 2005) and (iii) the chair is never on the losing side in the vote. Apel et al. (2015) show that members of the Swedish Riksbank's Executive Board exhibit overconfidence, since they give small importance to the opinion of their colleagues when forming their own views about the appropriate monetary policy decision. Finally, Farvaque and Matsueda (2016) argue that monetary policy-makers are likely to have the behavioral trait of overconfidence, if only because "[t]he people who have the greatest influence on the lives of others are likely to be optimistic and overconfident [...] (Kahneman, 2011, p. 252)".

However, far nothing is known about the impact of central bankers' overconfidence on the effectiveness of their policy decisions. Against this background, this article proposes to (i) compute the degree of overconfidence expressed by the Fed chair and perceived by the media and to

[1] Wigglesworth, R. (2016). "Keep Faith in Super Mario". *Financial Times*, April 21.

[2] Neuenkirch and Tillman (2016) define as superstars those central bankers who receive the top grade by the financial press.

(ii) assess its impact on financial market expectations. The rationale behind this procedure is that monetary policy is nowadays the art of managing expectations, and the ability of the central banker to improve the effectiveness of monetary policy depends upon its ability to credibly influence market expectations (de Haan et al., 2007).[3] Furthermore, we rely on media coverage to measure overconfidence given that what matters for our empirical exercise is not the *actual* overconfidence of the Fed chair, which is impossible to assess unless if psychometric tests are used, but the *perceived* overconfidence by the media, and thus, by financial market participants.[4] Hence, we quantify Fed chair's overconfidence based on their portrayal in the media and on outsiders' perception.

To test whether the Fed chair affects market expectations by expressing overconfidence, we proceed in four steps. First, we collect the articles published by four leading newspapers in economics and finance (*The New York Times*, the *Financial Times*, *The Economist* and *The Wall Street Journal*) that describe the Fed chair as confident, optimistic or variants such as overoptimistic. This measure employs counts of words relating to overconfidence or its opposite in proximity to the central banker name. Second, we compute the media-based proxy of Fed chair's overconfidence using article counts. The measure obtained allows to quantify the degree of overconfidence expressed by the Fed chair and perceived by the media and thus, by financial market participants. We find that the pattern of the media-based proxy of Fed chair's overconfidence can be explained in light of the main U.S. macroeconomic events, which suggests that this proxy may be influenced by the economic environment as well. The third step consists in purging the media-based proxy from the economic conditions that may affect it using the Romer and Romer (2004) approach. The exogenous component of the media-based proxy reflects the perception of the media of a specific dimension of Fed chair's personality, his/her overconfidence.

Nevertheless, although a Fed chair may be overconfident because of his/her personality, he/she may also use the overconfidence trait as a communication device and a signaling channel to influence market expectations. The overconfidence signaling channel is captured through the exogenous component of the media-based proxy since the latter measures the *perceived* overconfidence of the Fed chair and not the *actual* one.

Finally, we use the Generalized Method of Moments (GMM) to assess the impact of Fed chair's overconfidence on market expectations of inflation and unemployment. We use inflation and unemployment expectations since the Fed chair often expresses overconfidence on the development of these variables based on our reading of the media. Hence, if the Fed chair affects market expectations by expressing overconfidence, it is likely that it will involve for the most part inflation and unemployment. Our results show that overconfidence has a significant impact on financial market expectations, that is, an overconfident Fed chair is associated with higher inflation expectations and lower unemployment expectations. These findings are robust to (i)

[3]This is shown through the increasing communication tools used by central banks (such as press conferences, publication of minutes of meetings and voting records) in order to influence on financial market expectations.

[4]Hayo and Neuenkirch (2015) show that financial market participants are time constrained and that they must rely on the media to assimilate the flood of information and update their information sets.

the macroeconomic forecasts used to extract the exogenous component of the media-based proxy reflecting Fed chair's overconfidence (the Survey of Professional Forecasters and the Greenbook forecasts), (ii) different measures of the media-based proxy used to quantify Fed chair's overconfidence (continuous and dummy variables) and (iii) different measures of inflation expectations (survey-based and market-based measures). The results thus show that the Fed chair, by expressing overconfidence, significantly influences market expectations. Consequently, the Fed chair is able to affect the effectiveness of its monetary policy decisions by publicly expressing overconfidence.

The remainder of this paper is structured as follows: section 2 provides a review of the literature, section 3 describes the media-based proxy of Fed chair's overconfidence, section 4 assesses the impact of Fed chair's overconfidence on market expectations of inflation and unemployment, section 5 presents further extensions while the last section concludes.

II Related Literature

The importance of central bankers' personality dates back to Friedman (1962), who hypothesized that accident of personality can have significant consequences for a rule-based institution such as a central bank, especially in time of economic crisis. As an illustration, Friedman and Schwartz (1963) show that it was the shift of power from Benjamin Strong to George L. Harrison at the head of the Bank of New York in 1928 that explained the difference between the monetary policy of the Federal Reserve before and after 1929, and which contributed to the onset of the Great Depression. Friedman's (1962) hypothesis also played a central role in the theoretical literature on monetary policy.[5] This is illustrated in the Rogoff (1985) model of the conservative central banker, which shows that the inflation bias can be reduced by delegating the management of monetary policy to a central banker who puts more weight on the cost of inflation than does society. Similarly, the model of Cukierman and Meltzer (1986) distinguishes between different central banker types, hawks and doves, which implies different outcomes in terms of monetary policy.

More recently, the importance of central bankers' personality has been attributed to several causes: (i) the independence gained by central banks from political influence in the nineties which has made leadership important for their well-functioning (Blinder, 1999), and (ii) the need for central bankers to publicize and justify their policy decisions in order to be accountable, hence so doing, central bankers sometimes use a jargon intended to soothe the public with their expertise. As suggested by Blinder (2008), this "impression management" is a key characteristic of modern central banking. Following this line of thought, the literature finds that the personalities of Paul Volcker and Alan Greenspan influenced the monetary policy of the Fed (Siklos, 2002), and the personalities of Jean-Claude Trichet and Mario Draghi the monetary policy of the ECB (Basham

[5]The standard framework for modeling policy-makers' incentives, which started with Kydland and Prescott (1977) and Barro and Gordon (1983), used the objective function of the central banker to highlight the differences in central bank behavior.

and Roland, 2014).

A specific dimension of central bankers' personality that may influence the effectiveness of their policy decisions is overconfidence, which is an established cognitive bias in the psychology of judgment. The psychology literature finds that when policy-makers work in complex environments, such as for duties related to monetary policy, they tend to be overconfident and optimistic about the accuracy of their information (Odean, 1998),[6] and thus, of the models and theories they use to understand the economy. This is exemplified by the congress testimony of Alan Greenspan (the Fed chair during the period 1988M08-2006M01) on 2008, when he conceded that the GFC has exposed a mistake in the free market ideology which guided his 18-year stewardship of U.S. monetary policy. From a sociological point of view, Pixley (2004) explains the overconfidence trait by the fact that central bankers, unlike politicians, are limited in what they can accomplish, hence, showing overconfidence is the best strategy for them to achieve their objectives.

Furthermore, the psychology literature suggests that policy-makers who have the ultimate say about the strategic decisions are likely to satisfy the conditions for the existence of overconfidence (March and Shapira, 1987). Such a position may induce policy-makers to believe that they can control the outcome, and thus, underestimate the likelihood of failure and be too optimistic. The Fed chair is a case in point since most decisions implemented by the Fed are made in a consensual manner, even though committee members have different interpretations of the Fed's dual mandate, different economic data (Romer, 2010) and disagree on how to react to these data (Bennani, 2015). Anecdotal evidences suggest that this consensus is possible thanks to the presence of a dominant chair who influences other committee members during the decision-making process. Several papers document the prominent role of the chair during the policy process (Chappell et al., 2005a, 2005b; Meade, 2005; Blinder, 2007), and describe him/her as holding a disproportionate influence over Fed decisions (Meyer, 2004).[7] The leadership role of the chair is also evidenced by the FOMC minutes - which show that he/she is always on the winning side of a vote, the great public attention that his/her communication generates (Ehrmann and Fratzscher, 2007), and the formal powers that he/she has during the decision-making process: spokesperson, manager, agenda-setter and coalition builder (Kettl, 1986). This situation is not specific to the Greenspan era, as Chappell et al. (2005a, b) find that when Arthur Burns was chairing the FOMC, his opinion counted about as much as the 18 other committee members put together.

Consequently, there are strong theoretical and empirical evidences showing that the Fed chair may have the same cognitive bias, overconfidence, as other decision-makers holding top

[6] DellaVigna (2009) argues that people tend to "over-estimate their performance in tasks requiring ability, including the precision of their knowledge".

[7] As an illustration, former Governor Meyer argues that chairman Greenspan systematically influenced the preferences of the other Fed members prior to meetings: "the Chairman's disproportionate influence on Fed decisions, his efforts to build consensus around his policy recommendations before FOMC meetings, and the strong tendency for Committee members to support the majority view - all these were secrets of the temple that I learned at my first FOMC meeting", Meyer (2004, p. 50).

positions.[8] The aim of this article is thus to shed some light on the impact of Fed chair's overconfidence on market expectations of inflation and unemployment.

III Measuring Fed Chair's Overconfidence

III.1 The Overconfidence Indicator

Providing a quantitative measure of overconfidence is a difficult exercise as there is no direct instrument to measure a personality trait. Nevertheless, the existing literature in finance classify decision-makers as overconfident based on their portrayal in the major newspapers and magazines (Hayward and Hambrick, 1997; Malmendier and Tate, 2008). As an illustration, Malmendier et al. (2011) use a media coverage proxy to classify a Chief Executive Officer (CEO) as overconfident if he/she is *more* frequently described as "confident" and "optimistic" relative to descriptors such as "frugal", "conservative", "cautious", "practical", "reliable" or "steady". An additional measure to quantify CEO overconfidence is the option-based measure (for more details, see Malmendier and Tate, 2005), however, this measure is not appropriate in the case of central bankers. This makes the media-based proxy the sole relevant measure for computing Fed chair's overconfidence.

The media-based proxy relies on trait theory, which suggests that traits constitute underlying personality dimensions on which individuals vary. Trait theory is widely used by psychologists to measure and explain personality, and relies on a list of 18000 words compiled by Allport and Odbert (1936) to describe traits. More recently, the literature used factor analysis to reduce the number of traits in the list to five traits (Goldberg, 1981, 1993; McCrae and Costa, 1990, 1997), the Five Factor Model (FFM).[9] As suggested by Brown and Sarma (2007), the FFM has been used by studies in many fields using different data sets and has been found to be universal across cultures, which makes the FFM able to uncover general laws of personality structure according to psychologists.

Our measure of Fed chair's overconfidence is based on media portrayal and relies on the FFM. We use media coverage as a proxy to measure the perception of Fed chair's overconfidence for the period 1999M01- 2017M07: (i) Alan Greenspan for the period 1999M01-2006M01, (ii) Ben Bernanke for the period 2006M02-2014M01 and (iii) Janet Yellen for the period 2014M02-2017M07. We follow the existing literature about overconfidence (Malmendier and Tate, 2008; Malmendier et al., 2011; Hirshleifer et al., 2012) and collect data on how the main financial and economic media portray each central banker during the sample period using Factiva database. For each central banker, we record the number of articles published in *The Wall Street Journal*, *The New York Times*, the *Financial Times* and *The Economist* that portray the central banker as (a) "confident", "overoptimistic", "optimistic" and (b) "cautious", "conservative", "steady",

[8] Such as managers and investment bankers.

[9] The five factors are openness, conscientiousness, extroversion, agreeableness and neuroticism. Each of the factors represents several highly correlated sub-factors or traits.

"pessimistic", "gloomy","not confident" or "not optimistic" (table 9 in the appendix provides the frequency of the articles).[10] Hence, and following the psychology literature, we consider that an overconfident Fed chair has an optimistic bias. It is important to keep in mind that the keywords used to compute Fed chair's overconfidence are not chosen arbitrarily but are derived from the FFM of personality, thus, they describe the personality trait related to overconfidence. In a next step, we read each article to check whether the keywords describe the central banker and whether they are negated. Interestingly, we find that the Fed chair usually expresses overconfidence regarding the development of inflation and unemployment: "*This month Ms Yellen said her confidence in the inflation outlook had been 'bolstered' by recent strong jobs numbers [...]*".[11]

Finally, we develop the media-based proxy of Fed chair's overconfidence, the overconfidence indicator (OI), using article counts. For each month, we compare the number of articles using the "confident" terms, i.e. category (a), with the number of articles using the "cautious" terms, i.e. category (b). Following Malmendier et al. (2011), we consider that a Fed chair is overconfident if he/she is *more* described by the terms related to the category (a) than by the terms of the category (b). We measure overconfidence for each Fed chair at time t as:

$$OI_t = \frac{a_t - b_t}{Total_t} \tag{1}$$

where a_t reflects the number of articles published at month t and using the "confident" terms, b_t the number of articles using the "cautious" terms and $Total_t$ the number of articles that mention the Fed chair. We control for the total number of articles in the selected publications to address possible bias due to differential coverage. OI_t is a continuous variable that can be positive if the number of articles using "confident" terms is higher than the number of articles using "cautious" terms (when $a_t > b_t$) or negative if the number of articles using "confident" terms is lower than the number of articles using "cautious" terms (when $a_t < b_t$). We multiply the media-based proxy by 10 to ease its numerical interpretation.

Figure 1 below shows the development of the media-based proxy through the sampling period.

[10] Words such as "disciplined", "conscientious", "reliable", "frugal" and "practical" are used in the existing literature to describe CEO overconfidence but are not used to describe central bankers in the media.

[11] Fleming, S. (2015). "Set for lift-off: All eyes on Fed's signals as rate rise expected". *Financial Times*, December 15.

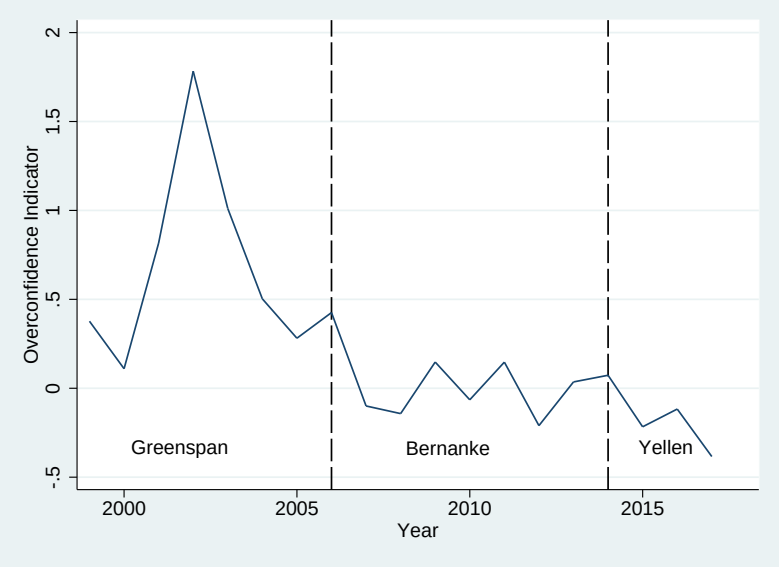

Figure 1: Overconfidence Indicator

It is first important to remind that figure 1 shows media's *perception* of Fed chair's overconfidence and not his/her *actual* overconfidence. This explains the variation of the OI through time. If we could graphically represent the *actual* level of Fed chair's overconfidence, we would expect a flat curve given the high level of inertia in individual's personality dimensions, among which overconfidence, with break-points displayed when the Fed chair is replaced.

The evolution of the OI may be explained by factors that influence media's perception of Fed chair's overconfidence. Figure 1 reveals that following the burst of the dot-com bubble in the late 1990s and the resulting drop of the overconfidence indicator, the media was prompt to describe the Fed chair (Alan Greenspan) as confident during the first years of the 2000s ($OI > 0$). This happened at a time of economic expansion and when the Fed was implementing a loose monetary policy. However, from 2003 onward, the OI started to decline progressively until attaining the trough with a negative value on mid-2008, a period coinciding with the collapse of Lehman Brothers and the start of the GFC. The quick Fed response to the burst of the crisis may explain the increase of the articles describing the Fed chair as confident during that period.[12] Nevertheless, the triggering of the sovereign debt crisis from the end of 2009 led to fiscal tensions in the euro area, and the uncertainty generated was felt in the global financial markets, including the U.S. one. This has raised some doubts on the soundness of the U.S. financial markets, which may explain the low, and sometimes negative, value of the OI throughout that period (2009-2012). However, the additional policies implemented by the Fed over that period may explain the constant and positive value of the OI during the year 2013.[13] Interestingly, the sudden drop of

[12]For instance by cutting its key interest rates until reaching the zero lower bound, supporting critical institutions (e.g., the American International Group) to avoid their collapse and providing liquidity to borrowers and investors (e.g., the Large Scale Asset Purchases and Maturity Extension Programs).

[13]Like e.g. the maintenance of the temporary currency liquidity swaps with various central banks and the

the OI from 2014 coincides with the new chairwomanship of Janet Yellen at the head of the Fed. This drop may be due to the criticisms that the Fed faced following the fuzzy communication of its chair about the future pace of the unconventional policy measures and the resulting confusion felt by market participants and the media.[14]

On one hand, the advantage of the media-based proxy of Fed chair's overconfidence is that it is less likely to suffer from endogeneity. For instance, it is difficult to argue that the way a central banker is described by the media influences his/her behavior in a way consistent with the description (e.g., describing a central banker as cautious causes him/her to take more cautious decisions). On the other hand, the OI may be influenced by the prevailing economic and financial conditions, e.g., an economic expansion (recession) phase may lead the Fed chair to express more (less) confidence. In order to avoid the problem of endogeneity with the business cycle, we follow Romer and Romer (2004) to extract the exogenous component of the OI and to provide a measure of the Fed chair's overconfidence which is not affected by information about past, current, or future economic developments.

III.2 The Exogenous Component of the Overconfidence Indicator

We use the quarterly forecasts of inflation, real activity and unemployment made by the Survey of Professional Forecasters (SPF) and published by the Federal Reserve Bank of Philadelphia to purge the indicator from the overconfidence that may be expressed by the Fed chair in response to information about economic conditions. In the surveys published by the Philadelphia Fed, the forecasters provide quarterly projections for five quarters. We use the mean forecasts of the unemployment rate, the real gross domestic product and the CPI inflation rate and set them into a monthly frequency by considering that the quarterly projection remains constant for the three months corresponding to this quarter. We also use the shadow rate of Wu and Xia (2016) to control for the overall policy stance and the presence of a zero lower bound on interest rates from 2008 until the end of 2015. Moreover, we also control for financial market volatility by including the VIX in the estimation procedure. Finally, since there could be omitted variables, for instance related to animal spirits, that may vary considerably over time and drive both the media-based proxy of Fed chair's overconfidence and market expectations, we use the Consumer Confidence Index to control for variations in animal spirits. The Consumer Confidence Index is obtained from the Consumer Surveys made by the Conference Board.

We regress the overconfidence indicator on these variables and consider the residuals from this regression as the exogenous component of the indicator. The residuals act as a proxy of the Fed's chair overconfidence, which is not expressed in response to information about past, current and future economic developments. The residuals must then be orthogonal to the central banker's information set. The specification is estimated over the period 1999M01-2017M07 and takes the

adoption of the forward guidance.

[14] See: Luce E., (2015). "Waiting for Yellen". *Financial Times*, September 20.

following form:

$$OI_t = \alpha + \delta\widetilde{i}_t + \sum_{i=1}^{6}\beta_i\widetilde{\pi}_{SPF,i} + \sum_{i=2}^{6}\gamma_i\widetilde{y}_{SPF,i} + \sum_{i=1}^{6}\eta_i\widetilde{u}_{SPF,i} + \theta\widetilde{X}_t + \zeta\widetilde{C} + \varepsilon_{OI_{SPF,t}} \qquad (2)$$

OI_t is the overconfidence indicator and $\widetilde{i}_t$ the shadow rate as measured by Wu and Xia (2016). $\widetilde{\pi}_{i,t}$, $\widetilde{y}_{i,t}$ and $\widetilde{u}_{i,t}$ reflect the forecasts of inflation, real output growth and the unemployment rate. We distinguish among the horizons of the forecasts by appending 1 to 6. The number 1 represents the forecast for the quarter prior to the quarter in which the survey is conducted, the forecasters know the values of the variables for this quarter at the time they submit their projections. The number 2 represents the forecast for the current quarter, while the numbers 3 to 6 represent the forecasts for the four quarters after the current quarter. Hence so doing, we consider that past, contemporaneous, and future economic conditions could affect the level of Fed chair's overconfidence. Finally, $\widetilde{X}_t$ represents the CBOE volatility index, $\widetilde{C}$ the Consumer Confidence Index while the residual $\varepsilon_{OI_{SPF,t}}$ reflects the exogenous component of the OI.

Table 10 in the appendix shows the estimated parameters of Eq. (2) and highlights the significant impact of the SPF forecasts on the media-based proxy of Fed chair's overconfidence. We find that a positive variation of output growth forecast for the fourth quarter ahead ($\widetilde{y}_6$) and a negative variation of unemployment during the previous quarter ($\widetilde{u}_1$) are associated with higher overconfidence. Interestingly, the low value of the R^2 (0.15) suggests that the economic environment is not the unique determinant of the level of the overconfidence indicator.

The value of the residuals of Eq. (2), $\varepsilon_{OI_{SPF,t}}$, constitute a relevant proxy to represent the exogenous component of the Fed chair's overconfidence. Figure 2 below shows the residuals of Eq. (2), i.e., the exogenous component of the overconfidence indicator.

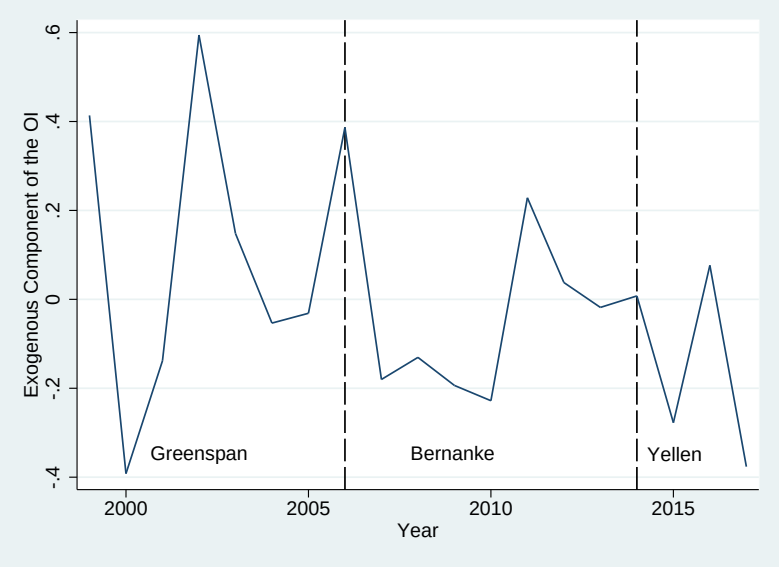

Figure 2: Exogenous component of the OI

The value of the exogenous component of the overconfidence indicator depicted in figure 2, $\varepsilon_{OI_{SPF,t}}$, has a similar trend as the indicator represented in figure 1, although with a higher magnitude. The last years of the 1990s were notably characterized by a sudden drop of $\varepsilon_{OI_{SPF,t}}$ which contrasts with the first years of the 2000s, a period where it reached its maximum value. Nevertheless, the triggering of the subprime mortgage crisis and the global financial crisis implied a fall of $\varepsilon_{OI_{SPF,t}}$ through the years 2007-2010, while from 2010 onward there was a rise during the Bernanke era until the chairwomanship of Janet Yellen on February 2014 where $\varepsilon_{OI_{SPF,t}}$ decreased and reached its minimum value.

IV The Impact of Fed Chair's Overconfidence on Market Expectations

IV.1 Fed Chair's Overconfidence and Inflation Expectations

To test the impact of the media-based proxy of Fed chair's overconfidence on inflation expectations, we estimate a model by considering the one-year expected inflation as a dependent variable. For the right-hand side variables, we first consider inflation expectations inertia (by including the lagged dependent variable) and the exogenous component of the media-based proxy reflecting Fed chair's overconfidence. We also consider variables that reflect short-term aggregate demand and supply shocks on inflation expectations. We follow the New Keynesian literature on the Phillips curve and consider for the demand shock the output growth as a measure of domestic

economic activity (Clark and McCracken 2006; Galí et al., 2007; Galí, 2008).[15] Regarding the supply shock, we consider international oil price changes. External factors, such as the relative changes in the trade-weighted exchange rate and import prices, may imply inflation expectations pressures and are therefore taken into account in the estimation procedure. Moreover, when the Fed considers that its objectives of inflation stability and maximum employment are not complementary under specific circumstances, it may sacrifice the goal of low and stable inflation by using expansionary monetary policies to achieve lower short-term unemployment or financing public deficits.[16] Hence, we include the fiscal surplus and the unemployment rate in our specification. We also consider the monetary policy regime by including a dummy variable that takes the value 1 when there is an inflation targeting (IT) regime and 0 otherwise.[17] Finally, we consider the current inflation rate as additional regressor. The estimation procedure takes the following form:

$$\widetilde{E}_t\pi^e_{t+12} = \alpha + \beta_1\widetilde{E}_{t-1}\pi^e_{t+12} + \beta_2\varepsilon_{OI_{SPF,t}} + \beta_3 Y_t + \beta_4 U_t + \beta_5 CPI_t +$$

$$\beta_6 Oil_t + \beta_7 Fiscal_t + \beta_8 REER_t + \beta_9 M_t + \beta_{10} IT_t + \varepsilon_t \tag{3}$$

where $\widetilde{E}_t\pi^e_{t+12}$ is the median of the one-year ahead expected inflation and $\widetilde{E}_{t-1}\pi^e_{t+12}$ its lagged value. $\varepsilon_{OI_{SPF,t}}$ is the exogenous component of the media-based proxy of Fed chair's overconfidence and Y_t the output growth, reflecting the annual GDP change. U_t is the unemployment rate and Oil_t the crude oil price expressed with U.S. dollars per barrel, and which represents the average of three spot prices: Dated Brent, West Texas Intermediate, and the Dubai Fateh. $Fiscal_t$ is the year-over-year change of the ratio of fiscal surplus to GDP, and $REER_t$ the yearly change of a weighted average of the foreign exchange values of the U.S. dollar against a subset of currencies of U.S. trading partners. CPI_t is the current inflation rate and M_t the yearly change of the import price index. IT_t is a dummy variable representing the inflation targeting regime. Finally, ε_t is an i.i.d. error term. All data are at a monthly frequency except for the inflation expectations and the GDP growth which are available at a quarterly basis. We use a liner interpolation procedure to transform these variables into a monthly frequency.[18] All variables are taken from Macrobond and the Fred St-Louis databases. Table 11 in the appendix provides the summary statistics of the data used in the estimation.

[15] We also consider the output gap as an alternative measure of demand shock and find similar qualitative and quantitative results. The output gap is measured as the difference between the annual change of GDP and its trend, obtained with a HodrickPrescott filter with a parameter λ set at 129600. Results available upon request.

[16] As an illustration, the fiscal theory of inflation stresses that the more excessive is public spending, the more likely is the use of seigniorage to finance public spending beyond tax revenue (Sargent and Wallace, 1981; Végh, 1989; Cukierman et al., 1992).

[17] During the estimated period (1999M01-2017M07), the Fed has adopted an inflation targeting regime on January 2012 when it issued a statement indicating that the Committee judges that inflation at the rate of 2% is most consistent over the longer run with the Federal Reserve's statutory mandate.

[18] We also use a set of alternative interpolation procedures (cubic, cubic spline, cubic hermite and nearest neighbor) to compute monthly data for inflation expectations. Figure 4 in the appendix shows the data obtained with the different interpolation procedures. We find the results of the estimations to be qualitatively and quantitatively similar whatever the interpolation procedure used to compute the monthly data. To save some space, alternative results are available upon request.

Since there is a possibility of endogeneity as the left-hand and the right-hand side variables are interdependent and simultaneously determined in the same period, the estimated parameters (β_n with $2< n <10$) may be biased and inconsistent. To tackle this issue, the independent variables related to those parameters are instrumentalized. However, an additional issue is the presence of heteroskedasticity, which invalids the diagnostic tests for endogeneity and over-identification. As suggested by Baum et al. (2003), this problem can be addressed with the Generalized Method of Moments (GMM) estimator introduced by Hansen (1982). The GMM estimator uses the orthogonality conditions to allow for efficient estimation in the presence of heteroskedasticity of unknown form. For the instruments, we use a constant and the lagged values of the explained and explanatory variables since they should signal future developments of the independent variables while being uncorrelated with the error term. Moreover, we face the problem that some instrumental variables are not necessary and distort our results. Hansen (1982) suggests a test for the validity of instruments by making a standard J-test for the validity of the over-identifying restrictions.

Table 1 below shows the results of the estimation for the period 1999M01-2017M07.

Table 1: Fed chair's Overconfidence and Inflation Expectations

Variable	Specification 1	Specification 2
α	0.81***	0.69***
	(0.09)	(0.11)
$\widetilde{E}_{t-1}\pi^{e}_{t+12}$	0.44***	0.52***
	(0.04)	(0.05)
$\varepsilon_{OI_{SPF,t}}$	-	**0.08*** **
		(0.01)
Y_t	0.06***	0.05***
	(0.005)	(0.006)
U_t	-0.03***	-0.03***
	(0.005)	(0.007)
CPI_t	0.18***	0.15***
	(0.01)	(0.02)
Oil_t	0.002***	0.001***
	(0.0003)	(0.0005)
$Fiscal_t$	-0.06***	-0.05***
	(0.005)	(0.007)
$REER_t$	0.001	0.003
	(0.001)	(0.002)
M_t	0.0006	0.002*
	(0.001)	(0.001)
IT_t	-0.06***	-0.03
	(0.02)	(0.03)
J-test	0.9	0.9
Adjusted R^2	0.95	0.95
Observations	220	220

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the output growth, the unemployment rate, the inflation rate, oil price changes, the fiscal surplus, the real effective exchange rate and the import prices. The statistical significance of the parameters is robust to the number of lags of instruments.

Estimation results are in accordance with the theoretical and empirical findings about the determinants of inflation expectations (see Castelnuovo, 2010) and the validity of the instruments is confirmed by the Hansen's J-test in both specifications. Furthermore, the value of the Variance Inflation Factor (VIF) highlights the absence of multicollinearity between the independent variables (VIF<5). All specifications exhibit evidence of inflation expectations inertia as reflected by the significant and positive parameter related to the lagged term, $\widetilde{E}_{t-1}\pi^{e}_{t+12}$.

The specification including the media-based proxy of Fed chair's overconfidence, $\varepsilon_{OI_{SPF,t}}$, shows that when the number of articles portraying the Fed chair with the "confident" terms exceeds the number of articles describing the Fed chair with the "cautious" terms, inflation expectations tend to increase. This finding suggests that when the Fed chair expresses overcon-

fidence, i.e., when he/she is portrayed as being more confident than cautious by the press, this has a significant and positive impact on inflation expectations of market participants.

All specifications deliver similar results, in terms of significance and value, on the impact of the output growth, the unemployment rate, the current inflation rate, the oil prices and the fiscal surplus on inflation expectations. We find that a positive variation of unemployment and the fiscal surplus imply a decrease of inflation expectations, while a positive variation of oil prices, output growth and the current inflation rate induce an increase of inflation expectations. The positive and significant sign related to the current inflation rate and the output growth show the relevance of the New Keynesian Phillips curve.

We find no influence of external factors on inflation expectations as shown by the non-significant parameter related to the exchange rate in all specifications. However, the result depicted in specification 2 highlights the positive and significant impact of import prices on inflation expectations (although with a significance at the 10% level only), while specification 1 shows that inflation expectations tend to be lower in an inflation targeting regime.

Overall, the results show that the media-based proxy of Fed chair's overconfidence has a significant impact on inflation expectations of market participants, that is, an overconfident Fed chair is associated with higher inflation expectations. Since an overconfident Fed chair has an optimistic cognitive bias according to our definition, this optimistic bias causes investors to revise upwards their forecasts regarding future inflation. This implies an increase in inflation expectations.

IV.2 Fed Chair's Overconfidence and Unemployment Expectations

Turning now to the impact of Fed chair's overconfidence on unemployment expectations, we estimate a model following a similar procedure. As a dependent variable, we use the one-year ahead U.S. unemployment expectations made by market participants. For the right-hand side variables, we follow the empirical literature (Bassanini and Duval, 2009) and consider a set of institutional, policy and economic factors. Previous references use institutional and policy data constructed by the OECD across countries and over time, and which show the labour market effect of policies and institutions (Scarpetta, 1996; Nickell, 1997, Blanchard and Wolfers, 2000; Nickell et al., 2005). Therefore, variables such as the tax wedge between labour cost and take-home pay (for a single earner worker), union membership rate (which proxies trade-union bargaining power), public expenditures on labour market policies and minimum wages constitute major policy and institutional determinants of unemployment. Furthermore, employment protection legislation and product market regulation also affect the level of unemployment (Blanchard and Giavazzi, 2003). We control for the impact of aggregate demand on unemployment expectations by adding the output growth as well as an additional variable that captures more directly the impact of demand, the real interest rate shock.[19] We augment the model by adding the current inflation rate.

[19]We also consider the output gap as an alternative measure of demand shock and find similar qualitative and quantitative results. The output gap is measured as the difference between the annual change of GDP and its

Finally, we use the exogenous component of the media-based proxy of Fed chair's overconfidence to highlight its impact on unemployment expectations.

The estimation procedure is consistent with the theoretical models of labour market equilibrium and takes the form of a standard job-search and wage-setting/price-setting model (Layard et al., 1991 ; Mortensen and Pissarides, 1994 ; Nickell and Layard, 1999). The estimation takes the following form :

$$\widetilde{E}_t U^e_{t+12} = \alpha + \beta_1 \widetilde{E}_{t-1} U^e_{t+12} + \beta_2 \varepsilon_{OI_{SPF,t}} + \beta_3 CPI_t + \beta_4 Y_t + \beta_5 Union_t + \beta_6 PubExp_t +$$

$$\beta_7 Tax_t + \beta_8 MinWage_t + \beta_9 Interest_t + \beta_{10} PMR_t + \beta_{11} EPL_t + \varepsilon_t \tag{4}$$

where $\widetilde{E}_t U^e_{t+12}$ is the median of the one-year ahead expected unemployment rate and $\widetilde{E}_{t-1} U^e_{t+12}$ its lagged value. $\varepsilon_{OI_{SPF,t}}$ is the exogenous component of the media-based proxy of Fed chair's overconfidence, CPI_t the year-over-year change of the inflation rate and Y_t the output growth, reflecting the annual change of the real GDP. $Union_t$ is the trade union density and corresponds to the ratio of wage and salary earners that are trade union members divided by the total number of wage and salary earners. $PubExp_t$ corresponds to public expenditure (as a percentage of GDP) which are explicitly targeted at groups of persons with difficulties in the labour market.[20] Tax_t is defined as the ratio between the amount of taxes paid by an average single worker with no children and the corresponding total labour cost for the employer and $Interest_t$ is the real interest rate shock, reflecting the difference between the 10-year nominal government bond yields and the annual GDP growth rate. $MinWage_t$ represents the hourly minimum wages at current prices. PMR_t is an in indicator that measures the economy-wide regulatory and market environment while EPL_t is a synthetic indicator of the strictness of regulation on dismissals and the use of temporary contracts. Finally, ε_t is an i.i.d. error term.

Since the the media-based proxy of Fed chair's overconfidence is a monthly variable, the annual labour market data ($Union_t$, $PubExp_t$, Tax_t, $MinWage_t$, PMR_t, and EPL_t) are set into a monthly frequency using piecewise constant interpolation. Concerning the quarterly survey and macroeconomic data ($\widetilde{E}_t U^e_{t+12}$ and Y_t), monthly frequency is computed using a liner interpolation procedure.[21] All data are taken from the OECD Labour statistics and Macrobond databases. Tables 12 in the appendix provides the summary statistics of the data used in the estimation procedure.

Furthermore, a potential concern when estimating Eq. (4) is the risk of reverse causality which would reflect the endogeneity of policies and institutions with respect to the level of unemployment expectations. To address this potential issue, we control for endogeneity by instrumenting the independent variables and using the GMM estimator. In addition, we check the validity of

trend, obtained with a HodrickPrescott filter with a parameter λ set at 129600. Results available upon request.

[20] Such as the unemployed, the employed at risk of involuntary job loss and inactive persons who would like to enter the labour market.

[21] Estimation results are similar qualitatively and quantitatively regardless of the interpolation procedure used to compute the monthly data (see Figure 4 in the appendix). Alternative test results available upon request.

the instruments by making a standard J-test for the validity of the over-identifying restrictions. Table 2 below shows the results of the estimation for the period 1999M01-2017M07.

Table 2: Fed chair's Overconfidence and Unemployment Expectations

Variable	Specification 1	Specification 2
α	3.26***	3.44***
	(0.71)	(0.62)
$\widetilde{E}_{t-1}U^e_{t+12}$	0.93***	0.93***
	(0.008)	(0.008)
$\varepsilon_{OI_{SPF,t}}$	-	**-0.02*** **
		(0.008)
CPI_t	-0.08***	-0.09***
	(0.02)	(0.01)
Y_t	-0.02***	-0.02***
	(0.009)	(0.009)
$Union_t$	0.04	0.04
	(0.03)	(0.03)
$PubExp_t$	-0.15**	-0.17**
	(0.07)	(0.07)
Tax_t	-0.12***	-0.13***
	(0.013)	(0.01)
$MinWage_t$	0.08*	0.07*
	(0.04)	(0.04)
$Interest_t$	0.04***	0.04***
	(0.009)	(0.009)
PMR_t	0.22	0.24
	(0.19)	(0.18)
EPL_t	-0.06	-0.06
	(0.46)	(0.42)
J-test	0.9	0.9
Adjusted R^2	0.9	0.9
Observations	220	220

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the inflation rate, the output growth, the unemployment rate, the trade union density, public expenditures, the tax wedge, the minimum wage, and the interest rate shock. The statistical significance of the parameters is robust to the number of lags of instruments.

Results shown in table 2 are in line with the theoretical and empirical findings about the determinants of unemployment expectations and the validity of the instruments is confirmed by the Hansen's J-test in all estimations. The value of the VIF suggests the absence of multicollinearity between the independent variables (VIF<5). Regarding the impact of Fed chair's overconfidence on market expectations, it has a negative and significant impact on unemployment expectations, thus showing that an overconfident Fed chair is associated with lower unemployment

expectations. Concerning the macroeconomic variables, the relationship between unemployment expectations and inflation (output) is negative and significant in both specifications.
As regards the institutional determinants, the impact of trade union density ($Union_t$) is not significant while a higher level of public expenditures ($PubExp_t$) implies lower unemployment expectations. This finding is in accordance with a rich empirical literature showing the beneficial effect of public expenditures on employment (Scarpetta, 1996; Nickell, 1998; Elmeskov et al., 1998). Furthermore, we find a negative (positive) relationship between the tax wedge (minimum wage) and unemployment expectations. The impact of labour taxes on unemployment comes in line with previous empirical studies which find that higher labour taxes do not necessarily increase unemployment as theoretical studies would suggest (Nunziata, 2002; Macculloch and Di Tella, 2005). Concerning the real interest rate shock ($Interest_t$), it has a positive and significant impact on unemployment expectations. Finally, there is no significant impact of policy factors (such as product market regulation "PMR_t" and employment protection legislation "EPL_t") on unemployment expectations.

Our results suggest that some labour market reforms and macroeconomic variables have a significant impact on unemployment expectations, but most importantly, that our media-based proxy of Fed chair's overconfidence is significantly related to the level of unemployment expectations. A higher (lower) level of Fed chair's overconfidence reduces (increases) unemployment expectations. Hence, an overconfident Fed chair (i.e., a Fed chair with an optimistic cognitive bias) causes market participants to revise downwards their unemployment expectations.
All in all, these findings confirm that Fed chair's overconfidence has a significant impact on market expectations, more specifically on inflation and unemployment expectations. Therefore, by publicly expressing overconfidence, the Fed chair is able to move market expectations of inflation (unemployment) upwards (downwards) and to affect the effectiveness of monetary policy decisions. We thus provide empirical evidences showing that the personality of a central banker matters for the effectiveness of the implemented policy measures.

The next section aims to provide further extensions to test whether these findings are robust to (i) the macroeconomic forecasts used to extract the exogenous component of the media-based proxy of Fed chair's overconfidence, (ii) different measures of the media-based proxy used to quantify Fed chair's overconfidence and (iii) different measures of inflation expectations.

V Further Extensions

V.1 Alternative Forecasts to Extract the Exogenous Component

To test whether the effect of the media-based proxy on market expectations is robust to the macroeconomic forecasts used to compute the exogenous component, we replace the SPF forecasts in Eq. (2) by the Greenbook forecasts. The Greenbook forecasts are prepared for each regularly scheduled FOMC meeting by the Division of Research and Statistics and, therefore, part of the information set the Fed chair has at hand when making its decision. Unfortunately, since the

Greenbook forecasts are published with a lag of 5 years, the most recent available forecasts are for the last semester of 2012 (as of June 2018).

We regress the media-based proxy on the Greenbook projections of the unemployment rate, the real gross domestic product and the CPI. Furthermore, we use the additional variables included in Eq. (2) to control for the overall economic environment (i.e., the shadow rate, the VIX and the Consumer Confidence Index). The estimation period is 1999M01-2012M10 and takes the following form:

$$OI_t = \alpha + \delta \widetilde{i}_t + \sum_{i=1}^{6} \beta_i \widetilde{\pi}_{GB,i} + \sum_{i=2}^{6} \gamma_i \widetilde{y}_{GB,i} + \sum_{i=1}^{6} \eta_i \widetilde{u}_{GB,i} + \theta \widetilde{X}_t + \zeta \widetilde{C} + \varepsilon_{OI_{GB,t}} \tag{5}$$

where $\pi_{GB,i}$, $y_{GB,i}$ and $u_{GB,i}$ represent the Greenbook forecasts of inflation, output growth and unemployment, respectively. $\varepsilon_{OI_{GB,t}}$ is the exogenous component of the media-based proxy computed with the Greenbook forecasts. The rest of the right-hand side variables and the time indicators are similar to those of Eq. (2).[22]

Figure 3 below shows the value of the residuals obtained from the estimation of Eq. (5), $\varepsilon_{OI_{GB,t}}$.

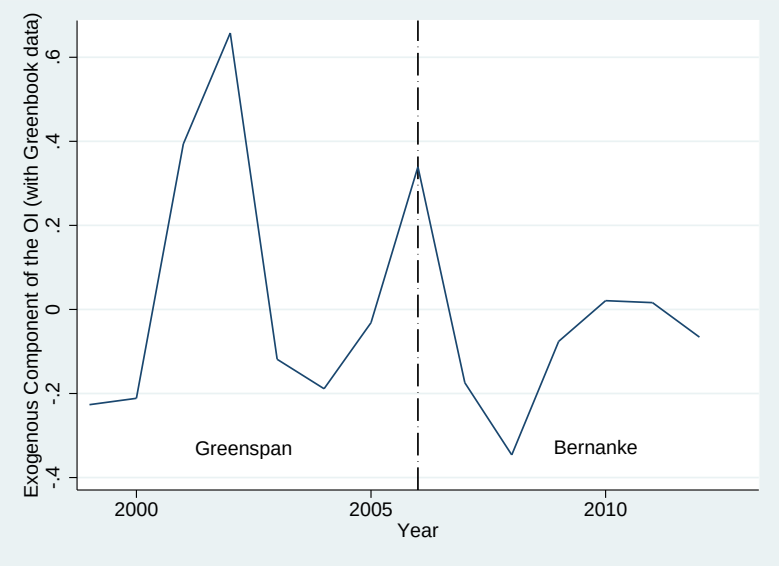

Figure 3: Exogenous component of the OI

The correlation between the exogenous component of the media-based proxy computed with the Greenbook forecasts ($\varepsilon_{OI_{GB,t}}$) and the exogenous component computed with the SPF forecasts ($\varepsilon_{OI_{SPF,t}}$) is very high (0.87). Hence, this shows that the value of the residuals is not sensitive to the macroeconomic forecasts used in the estimation procedure. Nevertheless, and as

[22] To save some space, estimation results of Eq. (5) are available upon request.

shown in figure 3, the residuals obtained from Eq. (5) are less volatile than those obtained from Eq. (2).

For the second step, we highlight the impact of $\varepsilon_{OI_{GB,t}}$ on inflation and unemployment expectations of market participants. We then replace $\varepsilon_{OI_{SPF,t}}$ in Eq. (3) and (4) by $\varepsilon_{OI_{GB,t}}$ and re-estimate these equations. However, since the sample period ends on October 2012, we do not consider the dummy variable corresponding to the inflation targeting regime included in Eq. (3) nor the policy factors (EPL and PML) included in Eq. (4). Tables (3) and (4) below show the results of the different estimations.

Table 3: Fed chair's Overconfidence and Inflation Expectations (with GB data)

Variable	Specification 1	Specification 2
α	1.1***	0.68***
	(0.1)	(0.12)
$\widetilde{E}_{t-1}\pi^{e}_{t+12}$	0.49***	0.57***
	(0.03)	(0.04)
$\varepsilon_{OI_{GB,t}}$	-	**0.18*** **
		(0.028)
Y_t	0.04***	0.03***
	(0.003)	(0.005)
U_t	-0.05***	-0.02***
	(0.005)	(0.007)
CPI_t	0.08***	0.14***
	(0.01)	(0.02)
Oil_t	0.001***	0.0009**
	(0.0003)	(0.0003)
$Fiscal_t$	-0.04***	-0.02***
	(0.004)	(0.008)
$REER_t$	-0.002*	-0.001
	(0.001)	(0.002)
M_t	-0.001**	0.003*
	(0.0008)	(0.001)
J-test	0.9	0.9
Adjusted R^2	0.9	0.9
Observations	160	160

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the output growth, the unemployment rate, the inflation rate, oil price changes, the fiscal surplus, the real effective exchange rate and the import prices. The statistical significance of the parameters is robust to the number of lags of instruments.

Table 4: Fed chair's Overconfidence and Unemployment Expectations (with GB data)

Variable	Specification 1	Specification 2
α	0.49	-1.71*
	(0.81)	(0.96)
$\widetilde{E}_{t-1}U^e_{t+12}$	0.89***	0.9***
	(0.008)	(0.009)
$\varepsilon_{OI_{GB,t}}$	-	**-0.06*** **
		(0.01)
CPI_t	-0.1***	-0.07***
	(0.01)	(0.01)
Y_t	-0.07***	-0.08***
	(0.01)	(0.01)
$Union_t$	0.06***	0.1
	(0.19)	(0.02)
$PubExp_t$	-0.07	-0.09
	(0.05)	(0.06)
Tax_t	-0.02	0.02
	(0.02)	(0.01)
$MinWage_t$	0.13	0.13
	(0.02)	(0.02)
$Interest_t$	-0.003	-0.01
	(0.01)	(0.01)
J-test	0.9	0.9
Adjusted R^2	0.9	0.9
Observations	150	150

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the inflation rate, the output growth, the unemployment rate, the trade union density, public expenditures, the tax wedge, the minimum wage, and the interest rate shock. The statistical significance of the parameters is robust to the number of lags of instruments.

According to tables 3 and 4, the effect of macroeconomic variables (inflation, output growth, unemployment, oil prices and fiscal surplus) on inflation and unemployment expectations is the same, in terms of sign and significance, across the different estimations (i.e., Eq.(2) and (5)). Moreover, an increase of the media-based proxy of Fed chair's overconfidence is associated with higher (lower) inflation (unemployment) expectations. This result shows that the impact of Fed chair's overconfidence on market expectations is robust to the macroeconomic forecasts used to compute the exogenous component of the media-based proxy.

V.2 An Alternative Proxy of Fed Chair's Overconfidence

To test whether the impact of Fed chair's overconfidence on inflation and unemployment expectations is robust to the proxy chosen to measure overconfidence, we follow Malmendier et al.

(2011) and Hirshleifer et al. (2012) and construct the media-based proxy as a dummy variable that takes the value 1 if the number of articles that use the "confident" terms is higher than the number of articles that use the "cautious" terms, and 0 otherwise. We measure Fed chair's overconfidence in month t as:

$$Confident\,CB_t = \begin{cases} 1 & a_t > b_t \\ 0 & otherwise \end{cases}$$

where a_t is the number of articles using the "confident" terms and b_t the number of articles using the "cautious" terms. We skip the steps corresponding to the computation of the exogenous component of the media-based proxy reflecting Fed chair's overconfidence (Eq. (2)) to be in accordance with the literature. We replace the previous media-based proxy of Fed chair's overconfidence ($\varepsilon_{OI_{SPF,t}}$) by the dummy media-based proxy ($Confident\,CB_t$) in Eq. (3) and (4). We add a variable corresponding to the total number of articles citing the Fed chair, $Total_t$, to control for any bias related to differential coverage. The rest of the left-hand side and right-hand side variables are similar to those of Eq. (3) and (4). The estimated equations take the following form:

$$\widetilde{E}_t\pi^e_{t+12} = \alpha + \beta_1\widetilde{E}_{t-1}\pi^e_{t+12} + \beta_2 Confident\,CB_t + \beta_3 Y_t + \beta_4 U_t + \beta_5 CPI_t + \beta_{46} Oil_t + \beta_7 Fiscal_t + \beta_8 REER_t + \beta_9 M_t + \beta_{10} IT_t + \beta_{11} Total_t + \varepsilon_t \quad (6)$$

$$\widetilde{E}_t U^e_{t+12} = \alpha + \beta_1\widetilde{E}_{t-1}U^e_{t+12} + \beta_2 Confident\,CB_t + \beta_3 CPI_t + \beta_4 Y_t + \beta_5 Union_t + \beta_6 PubExp_t + \beta_7 Tax_t + \beta_8 MinWage_t + \beta_9 Interest_t + \beta_{10} PMR_t + \beta_{11} EPL_t + \beta_{12} Total_t + \varepsilon_t \quad (7)$$

We estimate Eq. (5) and (6) using the GMM procedure. Tables 3 and 4 below show the results of the estimations for the period 1999M01-2017M07.

Table 5: Fed chair's Overconfidence and Inflation Expectations

Variable	Specification 1	Specification 2
α	0.70***	0.51***
	(0.13)	(0.1)
$\widetilde{E}_{t-1}\pi^{e}_{t+12}$	0.43***	0.42***
	(0.07)	(0.05)
$Confident\,CB_t$	**0.16*** **	**0.12*** **
	(0.02)	(0.01)
Y_t	0.05***	0.07***
	(0.006)	(0.008)
U_t	-0.02***	-0.01***
	(0.007)	(0.006)
CPI_t	0.19***	0.24***
	(0.03)	(0.03)
Oil_t	0.001***	0.003***
	(0.0005)	(0.0006)
$Fiscal_t$	-0.05***	-0.05***
	(0.007)	(0.007)
$REER_t$	0.0003	0.003
	(0.002)	(0.003)
M_t	0.003***	-0.0005
	(0.001)	(0.001)
IT_t	-0.008	-0.06*
	(0.03)	(0.03)
$Total_t$	-	-0.0007*
	-	(0.0002)
J-test	0.9	0.9
Adjusted R^2	0.95	0.95
Observations	220	220

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the output growth, the unemployment rate, the inflation rate, oil price changes, the fiscal surplus, the real effective exchange rate, and the import prices. The statistical significance of the parameters is robust to the number of lags of instruments.

Table 6: Fed chair's Overconfidence and Unemployment Expectations

Variable	Specification 1	Specification 2
α	0.20	0.01
	(1.48)	(1.56)
$\widetilde{E}_{t-1}U^e_{t+12}$	0.95***	0.96***
	(0.01)	(0.01)
$Confident\,CB_t$	**-0.32*** **	**-0.31*** **
	(0.04)	(0.04)
CPI_t	-0.14***	-0.12***
	(0.03)	(0.03)
Y_t	-0.06***	-0.06**
	(0.01)	(0.01)
$Union_t$	0.20***	0.23**
	(0.06)	(0.06)
$PubExp_t$	-0.36***	-0.52**
	(0.12)	(0.15)
Tax_t	-0.05***	-0.07*
	(0.02)	(0.02)
$MinWage_t$	-0.002	0.01
	(0.07)	(0.07)
$Interest_t$	0.012	0.01
	(0.01)	(0.02)
PMR_t	-0.32	-0.54
	(0.34)	(0.37)
EPL_t	0.76	1.09
	(0.81)	(0.81)
$Total_t$	-	-0.0006**
	-	(0.0003)
J-test	0.9	0.9
Adjusted R^2	0.8	0.8
Observations	220	220

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the inflation rate, the output growth, the unemployment rate, the trade union density, public expenditures, the tax wedge, the minimum wage, and the interest rate shock. The statistical significance of the parameters is robust to the number of lags of instruments.

The impact of the dummy media-based proxy, $Confident\,CB_t$, on inflation and unemployment expectations is similar to the impact of the media-based proxy, $\varepsilon_{OI_{SPF,t}}$, used in the baseline estimations (Eq. (3) and (4)). Hence, and as shown in tables 5 and 6, an overconfident Fed chair is associated with higher inflation expectations and lower unemployment expectations. Furthermore, all significant parameters related to macroeconomic, policy and institutional variables have the same sign and value as those shown in tables 1 and 2, except for the real interest rate shock and the minimum wage which are no longer significant in the new estimation.

Therefore, these findings confirm the relevance of the results obtained in the previous section, and thus, the significant impact of Fed chair's overconfidence on inflation and unemployment expectations of market participants.

V.3 Alternative Measures of Inflation Expectations

Inflation expectations are commonly gauged in two ways, from surveys of economists and from expected inflation rates implied in market interest rates. Even though measures of expected inflation based on surveys have been found to be generally superior to market-based measures, the resulting data points are widely spaced given that respondents to forecast inflation rates are asked for noncontiguous time horizons. Therefore, the use of alternative measures of inflation expectations may provide additional insights on the impact of Fed chair's overconfidence on market expectations. We use two alternative measures of inflation expectations to assess the impact of the media-based proxy of Fed chair's overconfidence on inflation expectations: (i) a market-based measure of inflation expectations, the TIPS breakeven inflation rate[23] and (ii) the Aruoba Term Structure of Inflation Expectations.

V.3.1 The TIPS Breakeven Inflation Rate

The TIPS breakeven inflation rate reflects market-based expectations for future headline CPI inflation. Given that the TIPS breakeven inflation rates are reliable only at longer maturities, we consider the 20-Year breakeven inflation rate as a a proxy for inflation expectations. The 20-Year breakeven inflation rate represents a measure of expected inflation derived from the 20-Year Treasury Constant Maturity Securities and the 20-Year Treasury Inflation-Indexed Constant Maturity Securities. While we can consider risk premiums to extract actual inflation expectations (using models such as Christensen et al., 2010 or Gürkaynak et al., 2010), we use raw unadjust market rates. Doing so, our results are not dependent to the choice of a specific model. We re-estimate Eq. (3) by considering the 20-Year breakeven inflation rate as a dependent variable:

$$T20YIEM_t = \alpha + \beta_1 T20YIEM_{t-1}\pi_{t+12} + \beta_2 \varepsilon_{OI_{SPF,t}} + \beta_3 Y_t + \beta_4 U_t + \beta_5 CPI_t +$$

$$\beta_6 Oil_t + \beta_7 Fiscal_t + \beta_8 REER_t + \beta_9 M_t + \beta_{10} IT_t + \varepsilon_t \quad (8)$$

where $T20YIEM_t$ is the 20-Year breakeven inflation rate and $T20YIEM_{t-1}$ its lagged value. Right-hand side variables are similar to those of eq. (3). Table 7 below shows the results of the estimation procedure for the period 1999M01-2017M07.

[23] Another market-based measure of inflation expectations is the inflation swaps introduced in the mid-2000s. Unfortunately, inflation swap rates are available from Thomson Reuters from mid-2007 only.

Table 7: Fed chair's Overconfidence and the TIPS Breakeven Inflation Rate

Variable	Specification 1	Specification 2
α	0.26***	0.49***
	(0.09)	(0.13)
$T20YIEM_{t-1}$	0.83***	0.73***
	(0.03)	(0.04)
$\varepsilon_{OI_{SPF,t}}$	-	**0.13*** **
		(0.02)
Y_t	0.08***	0.08***
	(0.01)	(0.01)
U_t	-0.009	-0.008
	(0.006)	(0.007)
CPI_t	-0.05*	-0.04
	(0.02)	(0.03)
Oil_t	0.002***	0.001
	(0.0006)	(0.0007)
$Fiscal_t$	-0.08***	-0.12***
	(0.01)	(0.01)
$REER_t$	-0.005*	-0.02***
	(0.002)	(0.001)
M_t	-0.01***	-0.01***
	(0.001)	(0.002)
IT_t	-0.13***	0.02
	(0.02)	(0.03)
J-test	0.9	0.9
Adjusted R^2	0.8	0.8
Observations	220	220

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the output growth, the unemployment rate, the inflation rate, oil price changes, the fiscal surplus, the real effective exchange rate, and the import prices. The statistical significance of the parameters is robust to the number of lags of instruments.

The results shown in table 7 suggest that the media-based proxy of Fed chair's overconfidence has a significant and positive impact on inflation expectations, as measured through the 20-Year breakeven inflation rate. Regarding the rest of the macroeconomic variables, the parameters related to the output growth, the oil prices, the fiscal surplus and the inflation targeting regime have the same sign and value as in the baseline estimation. Nevertheless, some differences with the baseline model are worth highlighting for the unemployment rate which has no significant impact on inflation expectations, and the real exchange rate and the import prices, which have a significant and negative impact on inflation expectations.

V.3.2 The Aruoba Term Structure of Inflation Expectations

The Aruoba Term Structure of Inflation Expectations (ATSIX) studies how inflation expectations evolve and respond to monetary policy. The ATSIX is a continuous curve of inflation expectations 3 to 120 months ahead available at a monthly frequency, and is created by using a statistical model to optimally combine major surveys: (i) the Survey of Professional Forecasters (published by the Federal Reserve Bank of Philadelphia), (ii) the Blue Chip Economic Indicators and (iii) the Blue Chip Financial Forecasts (published by Wolters Kluwer Law & Business).[24]
We use the one-year ahead inflation expectation computed by the ATSIX as a dependent variable to assess the impact of Fed chair's overconfidence on inflation expectations. We estimate the following equation:

$$ATSIX_t\pi_{t+12} = \alpha + \beta_1 ATSIX_{t-1}\pi_{t+12} + \beta_2 \varepsilon_{OI_{SPF,t}} + \beta_3 Y_t + \beta_4 U_t + \beta_5 CPI_t +$$

$$\beta_6 Oil_t + \beta_7 Fiscal_t + \beta_8 REER_t + \beta_9 M_t + \beta_{10} IT_t + \varepsilon_t \tag{9}$$

where $ATSIX_t\pi_{t+12}$ is the one-year ahead inflation expectation computed by the ATSIX at time t, and $ATSIX_{t-1}\pi_{t+12}$ its lagged value. Right-hand side variables are similar to those of eEq. (3). Table 8 below shows the results of the estimation procedure for the period 1999M01-2017M07.

[24] For more details on the statistical model, see Aruoba (2016).

Table 8: Fed chair's Overconfidence and the Aruoba Inflation Expectations

Variable	Specification 1	Specification 2
α	1.15***	1.12***
	(0.08)	(0.09)
$ATSIX_{t-1}\pi_{t+12}$	0.28***	0.3***
	(0.04)	(0.04)
$\varepsilon_{OI_{SPF,t}}$	-	**0.013****
		(0.006)
Y_t	0.04***	0.04***
	(0.003)	(0.003)
U_t	-0.03***	-0.03***
	(0.003)	(0.003)
CPI_t	0.24***	0.23**
	(0.01)	(0.01)
Oil_t	0.0003	0.0003
	(0.0002)	(0.0002))
$Fiscal_t$	-0.06***	-0.06***
	(0.004)	(0.004)
$REER_t$	-0.009***	-0.009***
	(0.001)	(0.001)
M_t	0.005***	0.005***
	(0.0008)	(0.0008)
IT_t	0.08***	0.09***
	(0.01)	(0.01)
J-test	0.9	0.9
Adjusted R^2	0.9	0.9
Observations	220	220

Standard errors are shown in between brackets. Estimates are obtained using 2 steps GMM. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. J-test is the p-value of the test of over-identifying restrictions. The list of instrumental variables includes a constant and the lags of the dependent variable, the output growth, the unemployment rate, the inflation rate, oil price changes, the fiscal surplus, the real effective exchange rate, and the import prices. The statistical significance of the parameters is robust to the number of lags of instruments.

The results highlighted in table 8 depict similar findings as those of table 1 regarding the impact of the media-based proxy of Fed chair's overconfidence, the output growth, the unemployment rate, and the current inflation rate on inflation expectations. However, the parameter related to the inflation-targeting regime has a positive sign while oil price changes do not have a significant impact on inflation expectations.

The findings of this subsection show that the impact of Fed chair's overconfidence on inflation expectations is robust to the measure chosen to compute inflation expectations, i.e. survey-based and market-based measures. Hence, this confirms that an overconfident Fed chair has a positive and significant impact on inflation expectations of market participants.

Conclusion

Drawing on the theoretical and empirical evidences showing the importance of central bankers' personality on the effectiveness of their policy decisions, this paper uses a media-based proxy to compute a measure of Fed chair's overconfidence for the period 1999M01-2017M07, the overconfidence indicator. Next, we use the Romer and Romer (2004) approach to purge the indicator from the overconfidence that may be expressed by the Fed chair in response to information about past, present and future economic conditions. The exogenous component of the overconfidence indicator obtained afterwards is supposed to reflect media's *perception* of a specific dimension of the Fed chair's personality, his/her overconfidence. As a final step, we use the GMM to test the impact of the exogenous component of Fed chair's overconfidence on market expectations of inflation and unemployment Our results show that overconfidence has a significant impact on market expectations, that is, an overconfident Fed chair is associated with higher inflation expectations and lower unemployment expectations. These findings are robust to (i) the macroeconomic forecasts used to extract the exogenous component of the media-based proxy reflecting Fed chair's overconfidence (the Survey of Professional Forecasters and the Greenbook forecasts), (ii) different measures of the media-based proxy used to quantify Fed chair's overconfidence (continuous and a dummy variables) and (iii) different measures of inflation expectations (survey-based and market-based measures). These results thus shed some new light on the impact of central bankers' personality on market expectations, and thus, on the effectiveness of their monetary policy decisions.

Appendix

Table 9: Frequency of the articles using the below mentioned words to describe the Fed chair during the period 1999M01-2017M07

Article	**Fequency**
confident	**140**
optimistic	**358**
overoptimistic	**14**
cautious	**267**
conservative	**9**
steady	**12**
pessimistic	**16**
gloomy	**21**
not confident	**13**
not optimistic	**12**

Table 10: Extracting the Exogenous Component of the Overconfidence Indicator

	Parameter	Stand. error
α	-0.31**	(0.15)
δ	0.0008	(0.004)
β_1	-0.001	(0.004)
β_2	-0.001	(0.007)
β_3	-0.019	(0.032)
β_4	0.04	(0.039)
β_5	0.004	(0.045)
β_6	0.008	(0.053)
γ_2	-0.005	(0.01)
γ_3	0.005	(0.015)
γ_4	0.005	(0.028)
γ_5	-0.009	(0.034)
γ_6	**0.065***	(0.033)
η_1	**-0.01****	(0.05)
η_2	0.21	(0.2)
η_3	-0.23	(0.45)
η_4	0.29	(0.53)
η_5	0.10	(0.51)
η_6	-0.27	(0.27)
θ	0.001	(0.001)
ζ	0.0006	(0.0006)
Adj. R^2	0.15	
D.W. statistic	1.91	
Observations	224	

Dependent variable: OI_t. Estimates are obtained using OLS with robust standard errors. *, ** denote significance at the 10% and 5% level, respectively. Standard errors in between parentheses.

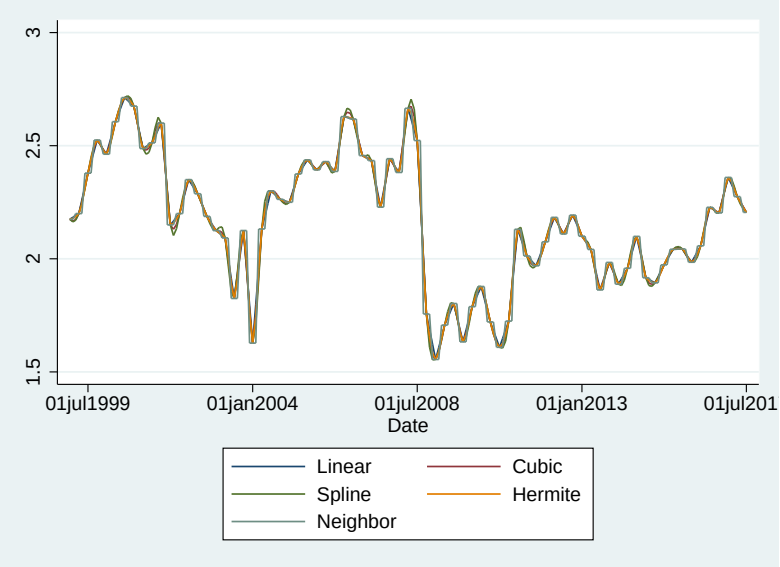

Figure 4: Interpolation procedures of quarterly inflation expectations

Table 11: Summary Statistics

	Mean	Median	St. dev.	Min	Max
$\widetilde{E}_t\pi^e_{t+1}$	2.16	2.17	0.27	1.51	2.71
Y_t	2.08	2.2	1.73	-4.06	5.26
U_t	6.04	5.5	1.76	3.8	10
Oil_t	59.75	54.51	28.7	12.01	133.88
$Fiscal_t$	-0.12	0.03	1.24	-5.63	4.01
$REER_t$	-0.11	-0.41	4.54	-9.33	11.84
CPI_t	1.99	2.06	0.45	0.60	2.93
M_t	1.72	1.93	7.28	-19.11	21.39

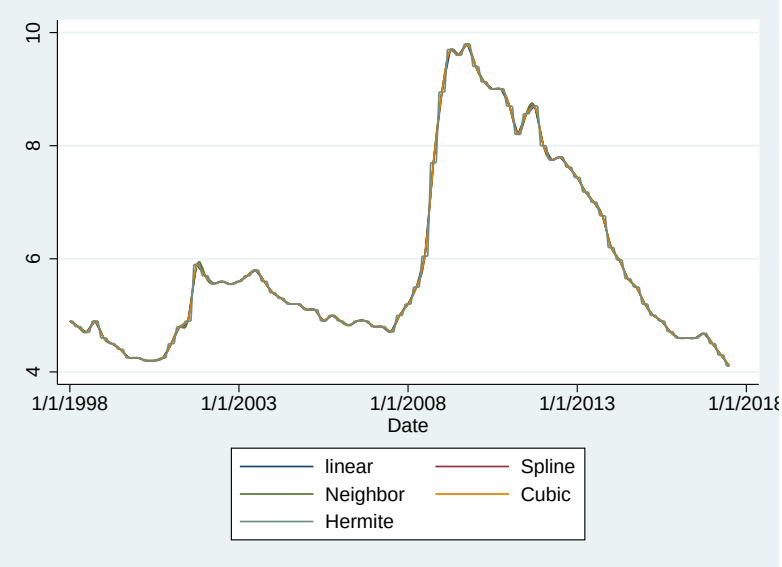

Figure 5: Interpolation procedures of quarterly unemployment expectations

Table 12: Summary Statistics

	Mean	Median	St. dev.	Min	Max
$\widetilde{E_t U^e_{t+12}}$	5.98	5.33	1.64	4.1	9.8
CPI_t	1.99	2.06	0.45	0.60	2.93
Y_t	2.08	2.2	1.73	-4.06	5.26
$Union_t$	11.69	11.56	0.83	10.65	13.36
$PubExp_t$	0.55	0.43	0.26	0.28	1.23
Tax_t	30.71	30.58	0.56	29.84	31.71
$MinWage_t$	6.17	6.15	0.99	5.15	7.25
$Interest_t$	1.60	1.12	1.83	-1.42	5.15
PMR_t	1.09	1.17	0.08	1.004	1.17
EPL_t	1.55	1.58	0.07	1.43	1.62

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