Perceived FOMC: The making of hawks, doves and swingers☆

Michael Bordo[a], Klodiana Istrefi[b],*

[a] *Department of Economics Rutgers University, New Jersey Hall 209A, 75 Hamilton Street, New Brunswick, NJ 08901, United States*
[b] *Banque de France, Monetary Policy Research Division, Paris, 75001, France*

A R T I C L E   I N F O

A B S T R A C T

An important and open question in monetary economics is how the Federal Reserve makes its policy decisions. We document that when an FOMC member was born, his/her educational background and the Committee's changing hawk-dove composition have predictable effects on FOMC decisions. The odds of an FOMC member being a hawk are higher when he/she graduated from a university linked to the Chicago school of economics; instead, a dove likely graduated from a university with strong Keynesian beliefs and was born during a period of high unemployment. These findings have implications for the choice of and confirmation of FOMC members.

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1. Introduction

An important question in monetary economics is understanding how the Federal Reserve makes its monetary policy decisions. These decisions arise from the deliberation and vote of a committee, the Federal Open Market Committee (FOMC) of the Federal Reserve.[1] In this context, the Fed's policymaking involves the aggregation of diverse individual member preferences and views into a collective decision. These preferences and the Committee's changing composition are a constant interest for academics, financial market participants, and Fed watchers. The diversity of policy preferences is traditionally summarized in labels, like hawk and dove. A hawk is a committee member who assigns a high priority to fight inflation, while a dove is more supportive of output growth and employment. Dividing central bankers into inflation-fighting hawks or growth-promoting doves can be too simplistic. We agree. Yet, market participants, academics, and central bankers

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* Corresponding author.
E-mail addresses: bordo@economics.rutgers.edu (M. Bordo), Klodiana.Istrefi@banque-france.fr (K. Istrefi).

[1] Well-designed committees are thought to be superior to individual decision-making because of the pooling of knowledge, the diversity of views or the checks it provides against extreme preferences or autocratic power (Blinder, 2004). Because committees are important for policy outcomes, literature has looked at their optimal design (see Reis, 2013; Sibert, 2006).

themselves use them as a convenient shorthand to summarize and communicate complex information on central bank governance and policymaking.

What molds the central banker's type as a hawk or a dove? And, does the composition of a committee in terms of hawks and doves matter for monetary policy decisions? We investigate these two questions in this paper, focusing on the FOMC. Our findings highlight the time when FOMC members are born and schools where they received their Ph.D., as deep determinants of their type. Importantly, we document that the hawk and dove FOMC's composition, as well as their deep determinants, help explain Federal Funds Rate deviations from the path described by a conventional forward-looking Taylor rule. Moreover, we show that the FOMC composition accounts for the variation in the importance assigned to forecasts of inflation and output in the FFR decision. Overall, our findings suggest that who is the decision maker matters for monetary policy.

The contribution of this paper relies on two original elements: i) the source of heterogeneity among FOMC members as hawks and doves, and ii) the importance of this heterogeneity for monetary policy decisions of the FOMC. Crucial to this investigation is the use of a novel measure characterizing the FOMC members as hawks and doves, by Istrefi (2019), covering more than 90% of the 130 FOMC members who have served in the FOMC since the early 1960s.[2] In the first step, the cross-sectional dimension of this measure will be crucial to uncovering the deep determinants behind hawk and dove preferences. In a second step, its time-series dimension will allow us to study the evolution of the FOMC composition in terms of hawks and doves and its importance for the Federal Reserve's monetary policy. As policy preferences are unobserved, Istrefi (2019)'s classification relies on narratives in U.S. newspapers, portraying the policy leanings of each FOMC member with respect to the dual mandate of the Federal Reserve: maximum employment and stable prices. For instance, in this classification, Paul Volcker is categorized as a hawk, Alan Greenspan as a swinger (referring to those members that switched camps over their tenure), and Ben Bernanke and Janet Yellen as doves.

We investigate the sources of heterogeneity among hawks, doves, and swingers at the FOMC, using insights from the literature on political science and social psychology. The latter suggests that people form their core economic and political beliefs during the early stages of life, and keep them mainly unaltered thereafter. In this context, we use the historical-economic background when FOMC members grew up and the ideas or "theories" in fashion at places where they studied, as a source for some clues on the formation of types. In addition, as FOMC members are appointed to their positions, we explore the match of hawks and doves with the political and/or institutional philosophies of those who appointed them. As our main focus is on the life experience before joining the FOMC and particularly, in the formative early years of the life of these members we abstracted from other factors that happened later in the life of FOMC members, such as their career background.

There are no clear-cut answers as to what makes a hawk, a dove, or a swinger. However, some tendencies are clear. We find that the odds of being a hawk are higher when a member graduates from a university linked to the Chicago school of economics ("freshwater"). In contrast, a dove has most likely graduated from a university with strong Keynesian beliefs ("saltwater"). In addition, a dove is most likely born during a period of high unemployment, like the Great Depression, and was appointed by a Democratic president. Swingers share several background characteristics of the doves. The major swings in the FOMC correspond with: i) the Great Inflation of the 1970s, ii) the discussion on price stability and inflation targets in the early 1990s, and iii) a new understanding of the economy (i.e following Alan Greenspan's revelation on productivity and inflation in the late 1990s).

Importantly, the FOMC's hawk and dove majorities matter for policy decisions. For the period 1987–2007, we find that a more hawkish FOMC is associated with a tighter policy, other things equal. A more dovish FOMC raises the likelihood that the FOMC will ease, other things equal. Strikingly, we find that the FFR is lowered by 80 basis points when shifting to a strong dovish majority. In addition, the response of the FFR to forecasted inflation is significantly lower when accounting for this supermajority. By contrast, a hawkish supermajority assigns a lower weight to the forecasted output gap. We also find that some of these supermajorities tend to happen in the first meeting of the FOMC with a new composition of voting members. This reflects the mechanical annual rotation of voting rights of four out of 11 FRB presidents (with the Federal Reserve of New York being a permanent voter). Our results suggest that changes in the FOMC composition, especially due to the rotation of the voting rights, can be a source of exogenous variation for Fed's monetary policy.[3] These results are robust to different specifications of the Taylor rule (assuming interest rate smoothing, among others), accounting for Fed Chair power and when considering sample periods from the early 1970s.

Interestingly, a Taylor rule that accounts for the FOMC composition in terms of "freshwater" versus "saltwater" Ph.D. graduates, suggests that the FOMC will hike the FFR when this difference increases. In terms of birth cohorts, the FOMC will ease policy with a higher number of members born during the Great Depression relative to those born after it. Accordingly, the odds of dissenting for a tighter policy are higher for "freshwater" Ph.D. graduates and that FOMC members born during the Great Depression have dissented more for easier policy than other cohorts.

Overall, our study highlights the importance of the FOMC composition for the FFR decision and it provides a rationale for the time variation in Taylor rule reaction coefficients. In addition, it suggests that ideas, through education especially,

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[2] While Istrefi (2019) provides us with a tool, it does not examine the questions investigated in this paper.

[3] In this context, Hack et al. (2023) use the FOMC rotation as an instrument for the FOMC's Hawk-Dove balance to assess the causal effects of the Fed's systematic monetary policy in the propagation of fiscal spending shocks in the U.S.

are persistent and have played an important role in the Fed's monetary policy. Our results echo the argument in DeLong (1997) and the comment of John Taylor in DeLong (1997) on the role of memories of the Great Depression and the role of the economic theories prevalent at the time, as the "truest" cause of the Great Inflation.

Our results contribute primarily to two strands of the literature, i) the studies on central bankers' policy preferences and their determinants, focusing on the Federal Reserve (see Belden, 1989; Chappell et al., 2005; Havrilesky and Gildea, 1989; Malmendier et al., 2020) and ii) the studies on decision-making in committees (see Blinder, 2004; Reis, 2013; Riboni and Ruge-Murcia, 2010; Sibert, 2006). We contribute by taking a stance on the formation of central bankers (with a focus on the Fed) and by bringing novel results on the importance of ideology by education (i.e., "freshwater" versus "saltwater" school) for shaping central bankers' preferences and policy outcomes. In particular, we examine what shapes an individual central banker as a hawk or dove. In contrast, previous studies focus on explaining mainly dissents (and more recently also the tone of speeches and FOMC forecasts). This distinction matters because, as discussed in the literature, dissents provide limited and often ambiguous information on central bankers' preferences.[4] As a result, dissents are very rare and any analysis focusing on them covers only a fraction of the FOMC, typically the regional Fed presidents. About 40% of FOMC members in our sample have never dissented and of those dissenting, very few have dissented regularly and consistently in the same direction. Instead, Istrefi's measure provides a wider coverage as it assigns a unique policy preference (such as persistent hawk, persistent dove, and swinger) to 93% of the FOMC members that have served in the last 60 years, which is missing in the literature. Our results speak directly to the role of personalities in the making of monetary policy and have implications for the political economy of the choice of and confirmation of the FOMC members.[5]

Concerning the formation of hawks and doves, we take insights from the literature in political science and social psychology that highlight early-life experiences and ideas as shaping one's personality (see Elder, 1998; Giuliano and Spilimbergo, 2014; Rodrik, 2014). We contribute to this literature by tying the policy beliefs of central bankers to these experiences, highlighting the importance of the transmission of knowledge and experience from parents and teachers.

Our paper relates to Malmendier et al. (2020) as we share the goal of understanding why central bankers may differ with regard to their economic beliefs and how that may influence policymaking. While similar in aim, the tools and the approaches we use are different. Importantly, we investigate the formation of the central bankers as persistent hawks, persistent doves, and swingers, and their effect on policy, using Istrefi's measure. There are no hawks and doves in Malmendier et al. (2020). Instead, they analyze the FOMC forecasts, dissents, and the tone of speeches. Istrefi (2019) shows that the Hawk and Dove measure captures well tendencies revealed by preferred interest rates, dissents and forecasts. In this regard, our analysis provides a straightforward and aggregated approach, with results speaking directly to the role of personalities, and the role of powers within the FOMC for policy making.

Another important difference relates to the factors that shape central bankers. Our focus is on the events that occur during the formative years of FOMC members (from birth to the mid-20s). Notably, we highlight the role of education, through schools of economic thought ("freshwater" vs. "saltwater"), as a significant factor shaping central bankers as hawks and doves, as well as policy outcomes. By contrast, Malmendier et al. (2020) highlight the role of inflation experiences, with a higher weight assigned to the recent data than to the past. Interestingly, the unemployment experience in Malmendier et al. (2020) is insignificant. Conversely, we document a dovish bias (and a lower FFR in the Taylor rule) for the cohort born during the Great Depression, suggesting a persistent effect of this event with very high unemployment as shaping central bankers and their policy decisions. We also find that a high unemployment rate experience before entering the FOMC lowers the odds of being a hawk. Finally, in the sensitivity analysis, we show that our results hold when accounting for the measure of inflation experience as measured by Malmendier et al. (2020). Thus, our findings on the long-lasting effects of life experience for central bankers could be seen as complements.

The paper is organized as follows: Section 2 describes our FOMC's hawk and dove measure. Section 3 discusses the sources of heterogeneity between types. Section 4 presents empirical results of the impact of the FOMC's Hawk and Dove composition and its deep determinants for the Fed's policy. Section 5 concludes.

2. Who are the hawks, doves and swingers?

In this paper, we use the classification of FOMC members as hawks, doves, and swingers as established in Istrefi (2019) (hereafter Istrefi's HD). This classification is based on U.S. newspapers' records of all relevant information that relates to the policy preferences of 130 FOMC members who served between 1960 to 2015 (hence, the perceived FOMC). This period comprises the FOMC under seven Fed Chairpersons, from William McChesney Martin to Janet Yellen. The narrative record in the media is used as a public source and a filter of all relevant information about the policymaker's type, as known in real-time. This classification is based on human reading of about 20,000 news articles or reports, from more than 30 newspapers and business reports of Fed watchers.[6] Readings of these records reveal that the perception of the policy

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[4] While FOMC members may disagree during the policy setting process, they are reluctant to formally cast a dissenting vote. Meade (2005) shows that during Greenspan's time, dissents accounted for 7.5% of the votes, while the internal disagreement was estimated to be about 30%.

[5] Romer and Romer (2004) have highlighted the role of personalities for policy outcomes when reviewing the lessons from history in choosing a Federal Reserve Chair.

[6] Some sources for the newspapers used are news archives like Proquest, Newspaper Archiver and Factiva but also financial reports from different market strategy firms (available online in the recent years).

makers' type is typically based on information on personal background, political interests, political supporters, on economic beliefs (expressed in member's writings, testimonies and speeches before joining and during tenure at the Fed) and from policy actions when they become public.

The classification of members as hawks or doves relies on two important steps, i) *the collection* of all available news article quotes that discuss or suggest the policy leaning of a particular FOMC member and, ii) *the evaluation* of each quote as indicating a hawkish or dovish leaning.[7] The selected relevant quotes are of two types. Either they contain a specific term associated to the FOMC member that suggests his/her policy preference or they cite the member's position with respect to (the actual or future) inflation and economic growth (unemployment, recession risks) or the preferred direction of policy (either money supply, interest rates, balance sheet) as a function of the most pressing economic problem to them, inflation or growth. The first are considered as an explicit expression of the perception on the type and the second as an implicit suggestion. The specific terms have changed over time, starting in the 1960s and 1970s with terms like conservative, monetarist, tight money guy and later on with the term inflation hawk, for those members perceived as leaning towards low inflation in contrast to liberal, easy money guy or dove for those members that are perceived to be more concerned about economic growth and employment.

For instance, William McChesney Martin, who served as the Fed's chairman from 1951 to 1970, is categorized as a hawk. Some examples of the newspaper quotes that have been evaluated in Istrefi (2019) as indicating a hawkish preference for Chairman Martin are the following: "he lists himself as a Democrat, but his associations have often been with Republicans of the conservative school" (The Wall Street Journal, 1957), "tends toward a harder money policy" (Los Angeles Times, 1965), "inflation is his concern" (Chicago Tribune, 1966), "Martin's critics complain that he is far too worried about inflation and not concerned enough with full employment and economic growth" (Los Angeles Times, 1968). Conversely, the quote, "Robertson, Mitchell and Maisel will remain as the liberal block and Martin will have only Shepardson as sure to vote with him on the conservative side" (Los Angeles Times, 1966) is one of many examples used to categorize Governors Robertson, Mitchell and Maisel as perceived doves and Governor Shepardson as a hawk, similarly to Chairman Martin. Two examples of quotes with a dove and a hawk categorization later in our sample are: "Dove: Charles Evans, has gained notoriety recently for promoting actions to reduce persistently high unemployment rates, even if such actions boost inflation above the Federal Reserve's informal 2% target." (The Wall Street Journal, 2012) and "Lacker is considered one of the more hawkish Fed officials, meaning he thinks the central bank may have to raise interest rates sooner to prevent inflation from getting too high." (The Wall Street Journal, 2012).

In Istrefi (2019), for each member, the hawk or dove classification of members is done ahead of each FOMC meeting, for the whole duration of the FOMC tenure. The FOMC member can start his/her tenure with Fed watchers having an expectation on the type or not (unknown preference).[8] If there are no new quoted articles in-between meetings, the member stays with the previous categorization. If yes, the new quotes may confirm or not the previous categorization of the member. Looking over each FOMC member's tenure, Istrefi (2019) observed that the majority of members are perceived consistently as either hawks or doves (69% of the sample).[9] However, some are perceived as switching camps over their tenure (classified as Swingers, 24%). While hawks and doves will both support tight or loose monetary policy if there is convincing evidence of doing so, they won't be perceived as having a "change of heart" in the eyes of the public. Swingers instead, are those situational hawks or doves, usually perceived in the media as "middle-of-the-roaders" or "centrists", who switch camps either for some years or those members perceived as having a complete "change of heart".[10] A recent example in this category is that of Narayana Kocherlakota, president of the Federal Reserve Bank of Minneapolis during 2009–2015. As a well-known hawk, until 2011 he was arguing against further monetary easing, suggesting that the Fed has become tolerant to inflation. By 2012, Kocherlakota made a complete shift from hawk to dove and market participants updated their perceptions on him accordingly. The Wall Street Journal refers to this case as follows: "*In the nearly three years Narayana Kocherlakota has held the keys to the Minneapolis Fed, the central banker has undergone a pronounced evolution from hawk to dove, in a shift made complete Thursday. [...] He noted he "liked" Mr. Evans's ideas. Mr. Kocherlakota's Thursday speech caught some Wall Street observers totally off guard.*"[11] Finally, 7% of the FOMC members in our sample are classified as Unknown because the existing media articles were not informative on the hawkish or dovish leanings of these members. These few members served in the early 1960s with sparse media coverage.

Although Istrefi's HD is a subjective measure based on media perceptions, Istrefi (2019) shows that its evolution matches well with narratives of monetary policy in the U.S. and with tendencies, not known in real-time, as expressed by preferred

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[7] The number of relevant quotes per member in-between FOMC meetings can vary from zero to more than 20. This difference in coverage is due to various factors. First, the coverage depends on the position of the FOMC member. Typically the Fed chair receives more media attention, thus, the odds that some of these articles discuss his/her policy preference are higher. Second, the time of the year - typically there is more discussion of policy preferences of all FOMC members at the beginning of the year with the new rotation of voting rights at the FOMC. Finally, it depends how outspoken are the FOMC members with public remarks which could in turn attract media attention and Fed watchers commentary.

[8] For instance, typically the expected policy leanings of Board of Governors members are discussed in the media during the period when the future member is nominated by the U.S. President and is waiting for the confirmation from the Senate. Once at the FOMC, clues on policy preferences can be inferred, in addition, from the positions that members will take, which may be expressed through speeches, testimonies and votes.

[9] Measures on the persistency of the type speak to the stability and to the intensity of the preference.

[10] A rule of thumb followed in the classification is that the perception on a member is considered as changed if there are supporting quotes for at least two consecutive meetings and from more than one media outlet.

[11] FED WATCH: Kocherlakota Completes Extreme Swing from Hawk to Dove, 20 September 2012, *The Wall Street Journal*.

Table 1

Summary statistics: persistent hawks, persistent doves and swingers.

	Hawk	Dove	Swinger	Unknown	Total (%)
Gender					
Male	48	31	28	9	89.2
Female	3	8	3	0	10.8
Position in FOMC					
Board of Governors	14	31	12	0	43.8
Regional Fed President	37	8	19	9	56.2
Education, highest					
Ph.D.	28	23	17	1	53.1
J.D. Law	1	4	3	2	7.7
Other	22	12	11	6	39.2
Education, Subject					
Econ./Pol. Economy	35	29	19	1	65.6
Other	15	9	12	8	34.4
All (%)	39.2	30.0	23.8	7.0	

Notes: Summary statistics for a total of 130 members serving in the FOMC during the period 1960 - 2015. Data on hawks, doves and swingers are as in Istrefi (2019). Data on personal background is mainly from: https://www.federalreservehistory.org/people.

interest rates (from FOMC transcripts in Chappell et al., 2005), by forecasting patterns of individual FOMC members and by dissents. Istrefi's HD captures media perceptions formed in real-time while information on individual forecasts and FOMC transcripts is not available to the public in real-time. This information has only become public since the early 1990s and, currently, their publishing delay is ten and five years, respectively. As such, this information is not part of the information set of the media when forming perceptions about the FOMC member's type.

Before 2002, information on FOMC voting records and dissents has been published with a delay as well.[12] This delay has ranged from 90 days after the meeting (up to 1975) to 45 days and one meeting after. Istrefi's HD measure might reflect this delayed information only if newspapers discussed dissents when they became public (and if this discussion was captured by the reading of newspaper articles by the author). Importantly, even if the media reported them with delay, dissents are rare (7% of the total votes in our sample). In addition, few members have dissented regularly and consistently in the same direction (about 40% of members have never dissented, and less than 40% have dissented at least twice, often with dissents in opposite direction). Thus, dissents would provide limited but also ambiguous information on the hawkish and dovish types. Moreover, dissents allow us at best to only compare groups of people and not individual members as is the case with Istrefi's HD measure, which assigns a unique policy preference to each FOMC member (93% of the 130 FOMC members in our sample).

Table 1 presents summary statistics for our three types: persistent hawks, persistent doves, and swingers. We have collected information on the personal background (education, career) of FOMC members from the biography pages of the Federal Reserve History website. In terms of gender, men in the FOMC are perceived slightly more on the hawkish side. Female FOMC members have been perceived mostly on the dovish side, however, the sample (14 out of 130 members) is too small to assign statistical significance to these numbers. The majority of women in the FOMC (11 of them) started their tenure from the 1990s onwards, which is a period characterized by a dovish trend for male FOMC members as well. Almost all women perceived as doves are from the Board of Governors, nominated to their position by a Democratic president. Besides, women perceived as hawkish or swingers have all but one represented regional Federal Reserve Banks (FRB). Interestingly, half of them have represented the Cleveland Fed, known for a high inflation-fighting appetite. This goes in line with the overall observation that within the FOMC composition, FRB presidents are systematically perceived as more hawkish and the Governors as more dovish. In terms of education, about 60% of FOMC members have a doctorate (either a Ph.D. in Economics or a JD Law). The rest include members with bachelor's to master degrees. In relative terms, hawks form a slightly larger share of the members with a Ph.D. in Economics, in contrast to those with a law degree where doves and swingers dominate.

In the following, we discuss how some of these characteristics relate to the policy preferences of FOMC members. Our first part of the investigation relies on a comparison of the persistent hawks, persistent doves, and swingers over the last 50 years. The second part studies the effect of the FOMC composition in terms of hawks and doves, and its deep determinants, on policy decisions.

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[12] Traditionally, policy preferences are proxied with dissents, i.e., votes opposite to the majority decision for easier or tighter policy. A few examples, like Chappell et al. (2005); Meade (2005) and Eijffinger et al. (2015) have used FOMC transcripts to learn about preferences before the voting takes place. Recently, Madeira and Madeira (2019) uses dissents to assess the effect of FOMC votes on financial markets and Madeira et al. (2022) assess the role of supply and demand shocks for policy disagreement.

3. What factors could mold the members' type?

We start by investigating two main factors that may have molded our FOMC members in the early years of their lives: ideology by education and major economic events. We base this investigation on insights from the literature on political science and social psychology, suggesting that people form their core economic and political beliefs during the early stages of life, and keep them mainly unaltered thereafter. In the next step, we look at the ideology (political and institutional philosophies) of those who appointed these members, which brings into the discussion partisanship in monetary policy. Finally, for swingers we explore some background characteristics and the economic environment, to understand when swings occur.

3.1. Ideology by education?

As Rodrik (2014) puts it, "the role of ideas in determining preferences has crept into various strands of research in economics". In many of these works, preferences are not determined exogenously but through exposure to societal outcomes, media, or early childhood experiences. Importantly, such influence is believed to happen during the early stages of life, further suggesting that as people grow up they become inflexible in their core beliefs (Krosnick and Alwin, 1989; Newcomb et al., 1967; Sears, 1975). For instance, the impressionable years hypothesis suggests that core attitudes, beliefs, and values crystallize during a period of great mental plasticity in early adulthood and remain largely unaltered thereafter (Giuliano and Spilimbergo, 2014). This period falls between 18 and 25 years of age (Krosnick and Alwin, 1989).

FOMC members are technocrats, therefore, the institutions where they studied (including the influence of teachers/mentors they had) could be natural habitats where their core economic ideas are formed.[13] Indeed, several interviews with Nobel Laureates in Economics show that it was the time during their university or graduate studies that marked their paths as an economist. For instance, Horn (2009) refers, among others, to James M. Buchanan and Gary S. Becker stating that it was studying at the University of Chicago that "turned them around" from their initial beliefs. Moreover, since graduate studies typically take place around the mid-twenties of age, one can think of beliefs formed in these institutions as persisting for a long time.[14] As Keynes (1936) puts it, "There are not many who are influenced by new theories after they are twenty-five or thirty years of age".

We look at the ideology by education in relation to "freshwater" and "saltwater" schools of thought, over which there is a long debate in macroeconomics. This labeling, first used in Hall (1976), relates to the geographical location of universities with different views in macroeconomics ("freshwater" being closer to the Great Lakes in the U.S. than to an ocean, and "saltwater" being closer to an ocean). The debate was especially heated during the 1970s following an even older division between the monetarists and the Keynesians.

About half of the FOMC members in our sample (53%) hold a Ph.D. in Economics. To categorize their Ph.D.-granting universities as "saltwater" or "freshwater", we have used the conventional wisdom of looking at who were the leading faculty members in money/macro in the years our FOMC members received their Ph.D.s. This is important as the geography of some schools has shifted over time, especially after the 1990s, with several exports between schools. FOMC members in our sample graduated between 1928 and 1990, years when the divide between the two schools was certainly more important than today.[15] We have categorized "saltwater" or "freshwater" the most straightforward cases and assigned the rest of the universities to the "other" category. This categorization, backed up by the references in the literature, is presented in Table A.1 in Appendix. In the "freshwater" group we have universities like Chicago, Carnegie Mellon University, and UCLA while in the "saltwater" group we have Harvard, Yale, MIT, and Berkeley, among others. The majority of FOMC members in our sample graduated from a "saltwater" university, owing to the high number of graduates from Harvard.

Figure 1 shows the match between our types and the economic thinking of the institution they graduated from. Most "freshwater"- Ph.D. graduates are perceived as hawks, in line with the ideology of the Chicago school and its "offshoots" where Milton Friedman, Robert Lucas, Karl Brunner, Allan Meltzer, and many others taught. The "saltwater" Ph.D. graduates appear rather balanced in type compared with "freshwater" graduates. Nevertheless, we notice a clear dovish and swinging bias, in line with the thinking of this school of thought where Paul Samuelson, Robert Solow, James Tobin and Arthur Okun, among many others, taught. The proportions of hawks and doves under the "freshwater" and the "saltwater" labels of Ph.D. graduates are statistically different from each other (*p*-value of 0.008 and 0.08, respectively). The match is not as striking for the non-Ph.D. group (bachelor's, master's, MBA), where most are perceived as hawks. Although doves have a larger share

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[13] Interview with Milton Friedman in Snowdon and Vane (2005), pg 200: "When you were a graduate student at Chicago, what interpretation did your teachers put forward to explain the Great Depression? Well, that's a very interesting question, because I have believed for a long time that the fundamental difference between my approach to Keynes and Abba Lerner's approach to Keynes, to take a particular example, is due to what our professors taught us. I started graduate school in the fall of 1932 when the Depression wasn't over by any means. My teachers, who were Jacob Viner, Frank Knight and Lloyd Mints, taught us that what was going on was a disastrous mistake by the Federal Reserve in reducing the money supply." Abba Lerner (19031982) was a Russian-born British economist who was taught by John R. Hicks, Lionel Robbins, and F. A. Hayek at the London School of Economics. He was considered an avowed Keynesian.

[14] The average age at entry to a U.S. Ph.D. program is 25–27 years (Stock and Siegfried, 2001).

[15] Onder and Tervio (2015) using citation data for top economics journals from 1990 to 2010 find a significant division between top universities, which is consistent with the divide between "freshwater" and "saltwater" schools. The "freshwater-saltwater divide" appears to be especially important for macroeconomics and econometrics.
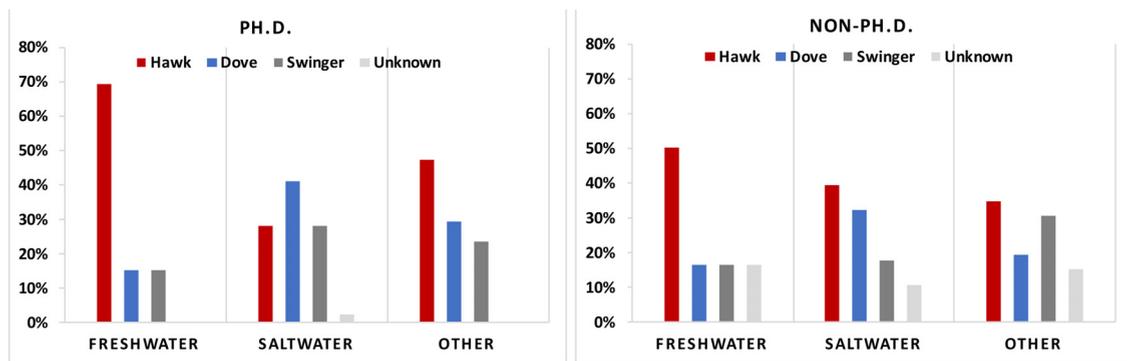
Fig. 1. Ideology by education/schools of thoughts. *Notes:* Sample comprises all the FOMC members that have served at the FOMC during 1960–2015. Data on types as in Istrefi (2019).

within the "saltwater" schools, and swingers within the "other" universities group, these proportions are not statistically different from each other.

Overall, we observe that FOMC preferences tend to correlate with the ideology of the graduate school attended. Perhaps, the most striking is the correlation between being a hawk and attending a Chicago-type of graduate school. Colander and Klamer (1987) report results from a 1985 survey in line with our findings. They compare students' opinions at six top-graduate schools in the U.S. on economic perspectives and the importance of economic assumptions (among other issues) and conclude that Chicago constitutes a "school" that is distinct from MIT, Harvard, Stanford, Columbia, and Yale, among others. They find that 100% of Chicago students agreed that inflation is primarily a monetary phenomenon compared with 54% at Harvard. Likewise, 85% of Chicago students agreed that the Fed should maintain a constant money supply; at MIT and Harvard 60% disagreed. In a follow-up survey, Colander (2003) show that Chicago graduates, 15 years later, continued to have the strongest belief that inflation is primarily a monetary phenomenon.

In our discussion, going to a "freshwater" or "saltwater" graduate school is exogenous to the hawk-dove perception, which is attributed later in life when these people become FOMC members. However, students may self-select. Among other factors, graduate students may sort themselves based on unobserved factors that relate to social and political values conditioned early on in life. For instance, some studies suggest that the family environment influences education and political participation (Beck and Jennings, 1982; Henderson and Berla, 1994; Jennings et al., 2009). In this regard, ideology by education can be considered as a "proxy" for other variables that we do not directly observe. However, the literature also suggests that some adjustment and reinforcement of economic views (Colander and Klamer, 1987) and political views (Colander, 2005) occurs in graduate school.

3.2. Life experience in early age

The role of one's environment on subsequent intellectual development is hardly any surprise. Great events leave great marks on people. For instance, it was the traumatic impact of the Great Depression that led several Nobel Laureates to pursue economics (Horn, 2009; Snowdon and Vane, 2005). The Great Depression was a defining event, sparking fundamental changes in economic institutions, macroeconomic policy, and economic theory (Bordo et al., 1998). Unsurprisingly, times of economic hardship also influence preferences for social and economic policy. Growing up in a recession affects people's preferences toward more government redistribution and support for left-wing parties (Giuliano and Spilimbergo, 2014). Importantly, Greider (1987) argues that the memories of the Great Depression pushed policymakers toward pursuing economic expansion and accepting the risk of inflation. Similarly, DeLong (1997) concludes that the memories of the Great Depression are the "truest" cause for the Great Inflation of the 1970s.[16]

How does the early-life experience square with our hawks and doves? In our sample, the birth years of FOMC members fall between 1892 and 1970. This period includes four great events: World War I, World War II, the Great Depression and the Great Inflation of the 70s. To begin, we take the Great Depression as the main reference point and examine members with birth dates before, during and after this event. Several studies have shown that the life pattern of children born during the Great Depression differed significantly from those born one or two decades earlier. For instance, Elder (1998) compares the lives of American children participating in two longitudinal studies, the Oakland Growth Study (birth years 1920–1921) and Berkeley Guidance study (birth years 1928–1929), finding that Berkeley children were more adversely influenced by the

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[16] The shadows of the Great Depression are also observed in the discussions of FOMC members. For instance, the Wall Street Journal in 1974 cites a speech by Fed Governor John E. Sheehan as he refers to Milton Friedman blaming the Federal Reserve for inflation. "Mr. Sheehan [...] added that a sharp cutback in money expansion would stall the economy and "would result in 15 to 20% unemployment by year-end, with 35 to 40% black unemployment and zero employment for black teenagers. Milton could go to his farm (in Vermont) and sit this out but when he comes back he will find the cities burned down and the University of Chicago along with them.", See "Fed's Sheehan Warns Against Big Effort to Squeeze Inflation", *WSJ*, 29 March 1974.
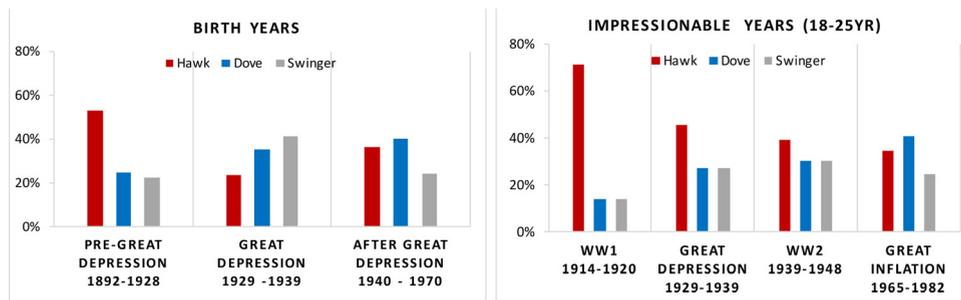
Fig. 2. Memories of great events run deep. *Notes:* Each war period includes the years of the war plus post-war inflation years. Left panel: all FOMC members (*n* = 120, excluding the Unknown types); right panel: only FOMC members with impressionable years in the defined periods (*n* = 90, excluding the Unknown types). The impressionable years are defined as ages of 18 to 25. Some members have impressionable years both during WWI and the Great Depression. This calculation includes only those that have unique impressionable years during one event. Data on types as in Istrefi (2019).

economic collapse of the Great Depression than were the Oakland adolescents. This literature emphasizes the role of time, place and linked or interdependent lives in explaining their life experience. Regarding linked lives, Elder (1998) argues that the influence of the Great Depression on children born during these years could be only understood through the adaptations to the hardship of people who were important in their lives.[17]

Figure 2 (left panel) shows the share of persistent hawks, persistent doves and swingers born before, during and after the Great Depression (corresponding to 53, 17 and 50 members, respectively). Hawks dropped significantly within the cohorts that were born during the Great Depression and after it, compared with the pre-Great Depression period (*p*-value of 0.03 and 0.08). Doves rose within the Great Depression cohort and more significantly after it (*p*-value of 0.42 and of 0.10, respectively). Swingers rose highest within the Great Depression cohort (*p*-value of 0.07).

Next, we look at FOMC members with "impressionable years" in one of the four great events: WWI, the Great Depression, WWII and the Great Inflation. Figure 2 (right panel) shows that the share of hawks is highest within cohorts with impressionable years during WWI (1914–1920), a period in which the inflation rate reached 23.7%, the highest rate of the 20th century (see Table A.2 in Appendix A). Further, the share of hawks drops while there is a build-up in the share of doves and swingers within the Great Depression, WWII, and the Great Inflation cohorts. Interestingly, the group of those born during the Great Depression shows a higher dovish and swinger bias than the group of those growing up during the Great Depression. This result is in line with the discussion of Elder (1998) on birth cohorts and the importance of parents for the transmission of knowledge and experiences. Given our small sample, we consider it as suggestive evidence.

The Great Depression is the worst economic downturn in the history of the industrialized world. The peak-to-trough decline in real GDP was 30% and the unemployment rate escalated to 25%. In turn, the WWII and Great Inflation periods both displayed a combination of high inflation and high unemployment (see Table A.2 in Appendix A). Inflation in the 1970s reached levels up to 14%, albeit lower than the levels experienced in the two world wars (23.7 and 19.7%, respectively).[18]

3.3. The ideology of those who appointed the FOMC member

FOMC members are appointed to their positions. Governors are appointed for fourteen years by the U.S. president, with the approval of the U.S. Senate, for 14-year terms. Each FRB president is appointed for a five-year term by his/her Bank's board of directors, with the approval of the Board of Governors. The appointment procedures of FOMC members are designed to minimize the influence of politics. We examine the types of FOMC members (hawk, dove or swinger) in relation to the ideology of who appointed them, i.e., Governors versus the party of the U.S. presidents and FRB presidents versus the FRB they represent. We have 57 Governors, 54% of whom are nominated by Republican presidents and 46% by Democratic presidents. The Republican nominees can be further characterized as traditional Republicans and as supply-side Republicans (corresponding to the Reagan presidency, (Havrilesky and Gildea, 1989). The partisanship on monetary policy would suggest that Republican administrations prefer tighter monetary policy and place more emphasis on fighting inflation, while Democrats prefer easier monetary policy to support economic growth (Alesina and Sachs, 1982; Hibbs, 1977; Stein, 1985).

In our sample, on average, Democratic Board nominees have been mostly perceived as doves and very few as hawks (left panel of Fig. 3). The share of hawks appears higher among Republican nominees but a slightly higher share of them is also perceived as doves. These proportions are not statistically different from each other (only for doves at p=0.12). This choice

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[17] Indebtedness, income loss and unstable work increased the economic pressure felt by families, in turn affecting also the quality of marriages and parenting. Fed Governor Martha R. Seger (1984–1991), a baby of the Great Depression, recalls her memories as a child making deliveries with her mother and sister and listening to the difficult stories of defeat and destruction during the Great Depression. See "Family Tradition", Contact Magazine of Adrian College, Fall 2013, p. 31.

[18] In 1985, Schuman and Scott (1989) ask a sample of 1410 Americans to report some important events in the last 50 years. The most recalled event was WWII, followed by the Vietnam War. The Great Depression ranked in the 8th position while inflation ranked in the 15th position. WWII or the Great Depression were recalled by those that experienced them in their teens or early 20s.
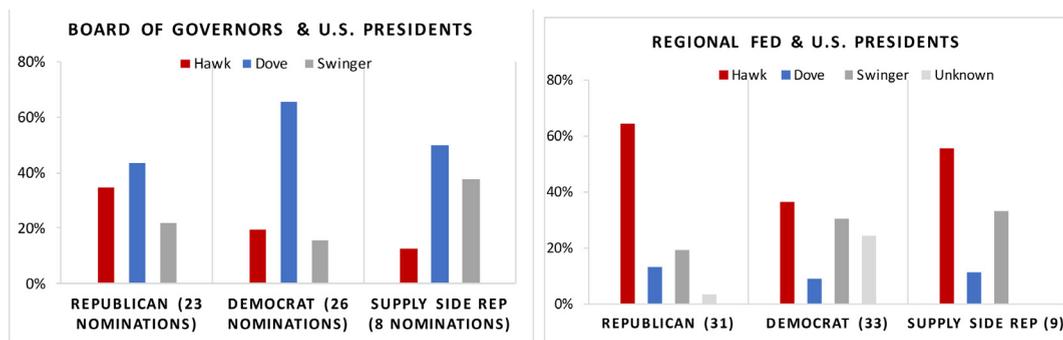
Fig. 3. Political or institutional philosophies get checked at the door? *Notes:* Sample in the figure comprises all the FOMC members that have served at the FOMC during 1960–2015. Supply side republican refer to Reagan and his nominations. Data on hawks, doves and swingers as in Istrefi (2019).

is not very surprising - if re-election motives are present, even Republicans may choose members with dovish preferences in expectation of policies to support growth and employment. Second, the U.S. president appoints Governors, but each of them has to be confirmed by the Senate. Nominees have higher chances of confirmation if they are likable' by both sides in the Senate. In our sample, 70% of Governors were confirmed in a Democratic-majority Senate. Finally, these results are based on 57 members of the Board, (including seven Fed Chairs) and, obviously, not all known Fed Chair nominations align with this distribution.

By contrast, when looking at FRB presidents, we observe a high share of hawks irrespective of the president's party (Fig. 3, right panel). Interestingly, the distribution of the types across FRBs shows that the hawkish bias is not uniform (see Fig. 4, panel a). Several FRBs have had presidents predominantly perceived as hawks, like the Cleveland Fed, the Dallas Fed or the St. Louis Fed. Doves are mostly perceived in the Philadelphia Fed and the San Francisco Fed. Beyond institutional memory and ideology, several other factors may explain this distribution of types, such as the ties of the regional Fed with the Board of Governors, how strong the ties of the regional Fed with the commercial banks of the region are, or the conservative versus liberal tendencies of regions.

3.4. Swingers: education, tenure and experience in FOMC

> "J Dewey Daane, an avowed "swinger" in policy [...] In policy matters, Mr. Daane is rather representative of the new breed's pragmatic approach, though he is sometimes criticized from the liberal side as not fully in tune with the "neo-Keynesian" economics of Gardner Ackley or of Walter Heller (the present and past chairman of the President's Council of Economic Advisors). "I am a neo-Keynesian", he protests." The Wall Street Journal, 1967[19]

An interesting breed of central bankers comprises those perceived to be in the swinging camp. We observe that in our sample the share of swingers is higher within the non-economist group (33%) than within the economist group (23%). Our non-economist group includes FOMC members with education in law (mostly doves and swingers), business management (equally shared among the three types), banking (mostly hawks), agriculture and public administration (swingers). Thus, by training, being a non-economist and having graduated from universities with no immediate relation to "freshwater"/"saltwater" schools increases the odds, albeit slightly, of being a swinger. In addition, a "change of heart" may take time. We find that swingers have longer tenure at the FOMC (in terms of minimum and median years). Nevertheless, some persistent hawks/doves had more than 20 years in the FOMC.

To understand when swings occur, we look at the distribution of the FOMC swingers over time (see panel b in Fig. 4). We observe three main swing periods, one in the early to mid-1970s and two during the 1990s to the mid-2000s. The first is a hawkish swing, corresponding with a period where inflation increased from an average of 1.3% during the first part of the 1960s to 6% in 1970, and to 12% by 1974. In response, some dovish members of the 1960s swung to becoming hawks. The second wave of hawkish swingers is perceived during the 1990s. The early 1990s saw intensified discussions on the importance of price stability and aiming for zero inflation at the Federal Reserve.[20] The third swing is dovish, in the late 1990s and early 2000s, and corresponds with Greenspan maintaining the line that the observed productivity trend in the 1990s had increased the potential for non-inflationary growth. This view was endorsed by some previously hawkish members. During this period Greenspan too is perceived to have switched to a dove.

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[19] "The Changing Fed: New Board Members Bring Liberal, Activist Approach", *The Wall Street Journal*, 8 March, 1967. J Dewey Daane (Board of Governors, 1963–1974).

[20] In 1989, the Reserve Bank of New Zealand introduced inflation targeting (0 to 2% target), and in the same year a congressional bill (H.J. Res. 409) called on the Fed "to adopt and pursue monetary policies leading to, and then maintaining, zero inflation". The view on price stability received wide support from the Federal Reserve.
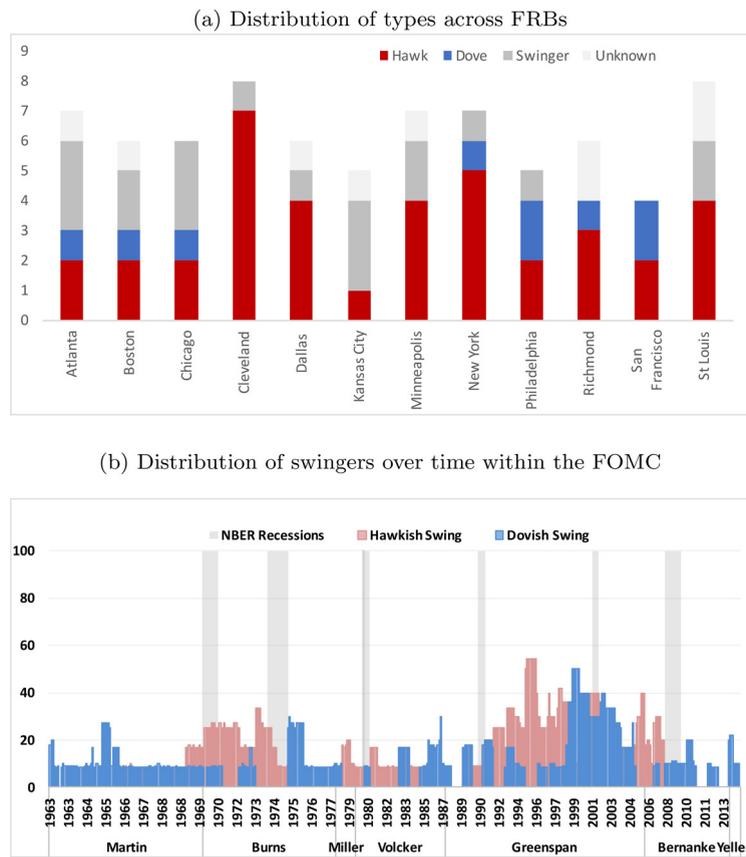
(a) Distribution of types across FRBs

(b) Distribution of swingers over time within the FOMC

Fig. 4. Ideology in the FRB presidents and Swingers. *Notes:* Sample in the figure comprises all the FOMC members that have served at the FOMC during 1960–2015. Panel a) is based on a total of 73 FRB presidents, including those that moved from a FRB president to a Fed Chair or Governor position, like Volcker, Coldwell and Yellen. Panel b) shows the distribution of swingers over time within the FOMC (the share of members who were perceived to shift from doves to hawks is in red, and the share of members who were perceived to shift from being hawks to doves in blue). Source of data: Hawks, Doves and Swingers as in Istrefi (2019). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

So far, we have looked at the match of ideology by education, big events in early life, and appointment with the central banker type in isolation. As discussed above, the history of economic thought has taught us that a main driving force behind the evolution of ideas is the march of events. For instance, the Great Depression was a defining event, sparking fundamental changes in economic institutions, macroeconomic policy, and economic theory (Bordo et al., 1998). In addition, the experience of inflation during the 1970s facilitated the monetarist and the new classical counter-revolutions (Snowdon, 2001). As a result, it would be difficult to tease out the specific effect of these events on the type.

With these caveats in mind, Table A.3 in Appendix A provides results from probit models considering all these factors together. In addition, we also control for the FOMC these types have been part of, i.e., under Martin's chairmanship or Greenspan's. We find that indeed the probability of being a persistent hawk decreases when being born during and after the Great Depression and when having experienced high unemployment rates before entering the FOMC. In contrast, the probability of being a hawk increases with members having earned their Ph.D. in a "freshwater" university. In addition, the probability of being a swinger is higher when born during the Great Depression and having served in the FOMC under the Greenspan's years as a Fed Chair.

In the following, we discuss how ideology by education and big events in early life, jointly affect the evolution of the FOMC's composition in terms of hawk and doves at the aggregate level.

3.5. Hawk and dove preferences at the FOMC level

So far, the analysis at the individual level suggests that having studied at a "freshwater" rather than a "saltwater" university seems to give cleaner answers than the cohort experience in explaining differences in preferences among FOMC members. In what follows, we study the impact of both on the variation of the FOMC composition between Hawks and Doves, over time.

Figure 5 shows the aggregate composition of the FOMC in terms of hawks and doves (panel a), in terms of cohorts born in one of our selected periods (panel b), and in terms of Ph.D. education (panel c). The FOMC composition from now on
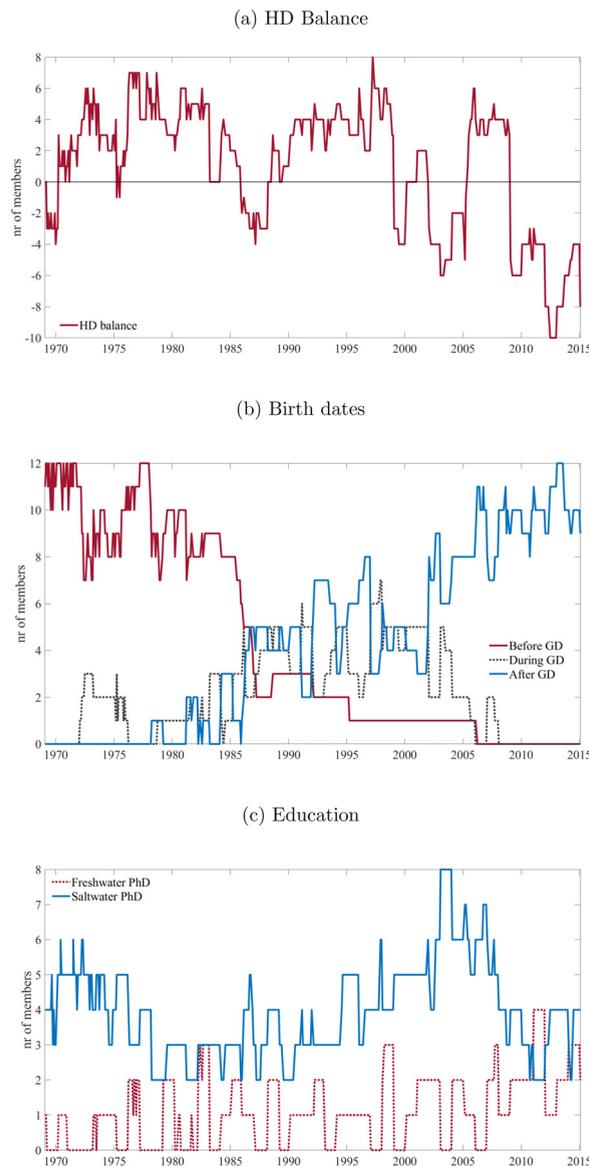
(a) HD Balance

(b) Birth dates

(c) Education

Fig. 5. FOMC composition by hawks and doves, by birth dates and by education. *Notes:* FOMC voting members composition. Data are for each FOMC meeting, for the period 1969:2 to 2015:1.

refers only to voting members of the FOMC and therefore additional variation observed in these variables will be due to the annual rotation scheme of four FRB Presidents. We define the Hawk-Dove balance as the difference of the total number of Hawk and Dove FOMC members at each FOMC meeting, $HD_t = \sum_{i=1}^{m} Hawk_{i,t} - \sum_{i=1}^{m} Dove_{i,t}$, m denotes the number of FOMC members (maximum 12), $Hawk_{i,t}$ and $Dove_{i,t}$ are respective hawk or dove dummies for each voting FOMC member, at meeting t.

Panel (a) shows a considerable variation in the HD balance, shifting from hawkish to dovish) majorities. For a detailed discussion of this variation, please refer to Istrefi (2019). Panel (b) shows that the composition of the FOMC with our three cohorts is relatively mixed only from the mid-1980s to the mid-1990s. Panel (c) shows that "Saltwater" Ph.D. graduates have been consistently in the majority, especially during the 1970s and the 2000s. The composition is more balanced in the early 80s and the last years of our sample.

In the following, we estimate the impact of the birth cohort and ideology by education on the Istrefi (2019) Hawk-Dove balance. In line with the discussion on the evolution of swingers, we also control for the state of the economy, to account for the possibility that the FOMC member may signal to the public hawkish or dovish leanings because of expectations of high inflation or a recession. We control for Greenbook forecasts, which are prepared by the Research staff at the Board of

Table 2
FOMC Hawk-Dove balance determinants.

Variables	(1)	(2)	(3)	(4)
Greenbook inflation	0.58***	0.45***	0.53***	
	(0.14)	(0.12)	(0.16)	
Greenbook output growth	0.14*	0.19***	0.20***	
	(0.07)	(0.07)	(0.07)	
Education				
Fresh Ph.D.-Salt Ph.D.		0.59***	0.57***	0.65***
		(0.19)	(0.19)	(0.19)
Birth				
before GD - after GD			−0.04	0.20
			(0.07)	(0.14)
during GD - after GD			0.04	−0.04
			(0.16)	(0.17)
Time trend				0.01
				(0.01)
R^2	0.17	0.26	0.26	0.19
s.e.e	2.81	2.66	2.66	2.77
AIC	4.91	4.80	4.81	4.89
SIC	4.94	4.85	4.88	4.94

Notes: Columns 1 to 4 in the table present least squares estimates for different specifications of the Hawk/Dove balance, estimated for the period 1969:2–2007:06. Fresh Ph.D. and Salt Ph.D. denote the number of "freshwater" and "saltwater" Ph.D. graduates, respectively and born before GD, during GD and born after GD denote the composition of the FOMC in terms of birth cohorts. Newey-West HAC standard errors are reported in parentheses.
*** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

Governors some days before each FOMC meeting and are made available to all FOMC members.[21] The general regression that we estimate is as follows:

$$HD_t = c + \phi_\pi E_{t^-} \pi_{t+2,t+1} + \phi_{dy} E_{t^-} dy_t + CompEducation_t + CompBirthcohort_t + \epsilon_t, \tag{1}$$

where, HD_t is the Istrefi (2019) Hawk-Dove balance. Media perceptions of whether a member is a hawk or a dove are based on public information known before the FOMC meeting. *CompEducation* is the balance of FOMC members with Ph.D. from "freshwater" vs. "saltwater" universities and *CompBirthcohort* is the composition of FOMC members born in respective cohorts. In addition, E_{t^-} denotes Greenbook forecasts formed some days prior (t^-) to the FOMC meeting t; $E_{t^-}\pi_{t+2,t+1}$ is the average forecast of inflation over one and two quarters ahead; $E_{t^-}dy_t$ is the forecast for the contemporaneous growth rate of output. ϵ_t is a residual to account for other unobserved variables that might influence the HD balance. We use the Greenbook forecasts dataset as in Coibion and Gorodnichenko (2011) and Coibion and Gorodnichenko (2012) for the period 1969–2006 which we updated up to 2007:06. We end our sample before the start of the financial crisis, in line with the sample in the Taylor rule analysis that follows.

The state of the economy can explain a small part of the variation in the Hawk-Dove Balance, with the balance increasing as expectations for inflation and growth increase (Table 2, column 1). In addition, the balance of "freshwater" and "saltwater" Ph.D. graduates has a relatively strong effect on the determination of the Hawk-Dove balance of the FOMC. Estimates for the birth cohort balances are not statistically significant. In column (4), we show estimates of Eq. (1) without Greenbook forecasts, adding a time trend. We observe that not controlling for the state of the economy gives more weight to Education. Finally, a time trend does not explain the composition of the FOMC in terms of hawks and doves.

Overall, these results suggest that having graduated from a "freshwater" vs. "saltwater" university matters for the policy preference composition of the FOMC. Nonetheless, even when controlling for the state of the economy, a large part of the variation in the Hawk-Dove balance remains unexplained ($\bar{R}^2 = 0.28$). Among other factors, this variation could be due to the rotation scheme of voting rights of FRB presidents which is exogenous, and to the turnover of members.

4. Hawks and doves and monetary policy

Does the composition of the FOMC in terms of hawks and doves affect the setting of monetary policy? How do the deep determinants of hawks and doves influence their voting on monetary policy decisions? Does the FOMC member's educa-

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[21] Our working assumption is that the staff forecast is independent to the preference of the FOMC. Since 1979, the FOMC members have their forecasts (available from 1992 onwards and published with a 10-year delay). Romer and Romer (2008) discusses that these forecasts are different from the staff forecasts and that the predictive ability of the staff's forecasts is substantially better than the FOMC's forecasts. Ellison and Sargent (2012) suggest that the FOMC uses its forecasts based on a worst-case scenario to design its policy decisions.

tion/ideology affect (on average) their support for raising /lowering/ or keeping the policy rate constant? In this section, we use econometric methods to answer these questions. As is traditional in the literature, we employ an interest rate reaction function that links the endogenous response of monetary policy to macroeconomic conditions, in the spirit of Taylor (1993). We consider simple versions of Taylor rules that use real-time measures of the Federal Reserve's forecast of macroeconomic conditions (i.e., Greenbook forecasts) as advocated by Orphanides (2003).

4.1. Forward-looking Taylor rules and FOMC composition

We start with a baseline estimation, as in Coibion and Gorodnichenko (2012), where a preferred specification comprises the forecasts for inflation, the growth rate of output, and the output gap. We augment this specification with measures of the FOMC composition in terms of hawks and doves, and last, with their early-life experience determinants.

Before proceeding with the estimation, we have to take a stance on the form that preferences enter in the Taylor rule. Often the literature considers changes in policy preferences as a source of monetary policy shocks. As Christiano et al. (1999) note, monetary policy shocks could reflect exogenous impulses to the preferences of the monetary authority, perhaps due to stochastic shifts in the relative weight given to unemployment and inflation. The latter could reflect changes in the preferences of the FOMC members, either because of shifts in the political power of committee members or in the factions that they represent.

In line with this reasoning, we will consider several variants of the augmented Taylor rule. These take into account various forms that the FOMC composition can enter into the Taylor rule, (i) as an additional variable or as an interaction term with forecasts of inflation and output, (ii) as a simple balance of hawks versus doves or as strong hawk or dove majorities, (iii) as the balance of "freshwater" vs. "saltwater" Ph.D. members, and so on.

We begin with a forecast-based Taylor rule, augmented with the FOMC composition as follows:

$$i_t = c + \phi_\pi E_{t^-}\pi_{t+2,t+1} + \phi_{dy}E_{t^-}dy_t + \phi_x E_{t^-}x_t + \phi_{FOMC}CompFOMC_t + v_t, \tag{2}$$

where i_t is the target federal funds rate (FFR) set at each meeting, $E_{t^-}\pi_{t+2,t+1}$ is the average Greenbook forecast of inflation over one and two quarters ahead; $E_{t^-}dy_t$ is the forecast for the contemporaneous growth rate of output and $E_{t^-}x_t$ is forecast for the contemporaneous output gap and v_t an idiosyncratic residual, to account for other unobserved variables that could influence policy.[22] The $CompFOMC_t$ is the composition of the voting FOMC based on media information before meeting t.[23] Since all right-hand variables are decided prior to the interest rate decision, we estimate our Taylor rules by least squares as in Coibion and Gorodnichenko (2012). Carvalho et al. (2021) have argued in favor of OLS estimates for monetary policy rules, showing that for realistic sample sizes, the OLS estimator of monetary policy parameters outperforms in precision the IV estimators.

Our main Taylor rule specification will be estimated for the period 1987–2007. The start of the sample corresponds with the time when the Federal Reserve's staff forecast of the output gap becomes available. We end the sample just before the Great Financial Crisis, thus avoiding periods for which a standard rule with inflation and the output gap would not represent what the Federal Reserve may have used as a reaction function. Likewise, we avoid the period when interest rates reached the effective lower bound and the Fed resorted to forward guidance on rates and balance sheet policies, for which a standard Taylor rule would not be appropriate. The FFR was kept constant from December 2008 to December 2015 at the zero lower bound. For these reasons, the literature that studies the Fed's decisions with Taylor rules typically restricts the estimation sample to 2007 or 2008 (Malmendier et al., 2020; Shapiro and Wilson, 2022). For robustness, earlier periods will be treated as well when applicable. We are cautious when using earlier samples as monetary policy has been conducted with different instruments over time. Moreover, meeting frequencies and procedures have been different as well.

A Taylor rule with the Hawk and Dove composition The FOMC votes by simple majority, as such, we first consider the effect of the simple HD balance. Moreover, the power of hawk and dove majorities on policy setting may be nonlinear - as majorities get stronger the effect on the policy may be stronger. To this end, we will consider the effect of hawkish and dovish super-majorities also, defined as dummy variables that take the value 1 if the HD balance is greater (lower) or equal to its 75th (25th) percentile and zero otherwise. Finally, in line with the FOMC's "one member, one vote", when constructing the HD balance we assign to all voting members the same weight. In robustness checks, we provide results for the HD balance with a higher weight on the preference of the Fed Chair. We provide a graphical comparison of these measures in Fig. A.1 in Appendix A.

For comparison, we start Table 3 with estimates for the Taylor rule abstracting from the FOMC composition (column 1). In columns (2) and (3) we show estimates for the Taylor rule with different specifications for the HD composition. The estimate for the HD balance is positive and statistically significant, suggesting that a rise in the hawkishness of the FOMC is associated with a rise in the FFR (column 2). This effect is economically significant, whereby a one standard deviation

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[22] In the choice of forecast horizon, we follow the literature Coibion and Gorodnichenko (2012); Romer and Romer. (2004) and Shapiro and Wilson (2022) where the usage of "short-run" forecasts is meant to cover the time horizon over which the central bank takes forecasted inflation and output gap as exogenous. Our baseline Taylor rule with forecasts of inflation over one and two quarters ahead and forecasts of contemporaneous output gap and output growth is the preferred rule in Coibion and Gorodnichenko (2012).

[23] While all FOMC participants deliberate on policy, our aggregated balance is defined over the voting FOMC members only, for the measure to reflect the exogenous variation in preferences due to the annual rotating scheme of voting rights of FRB presidents.

Table 3
Taylor Rules augmented with FOMC composition, 1987–2007.

Variables	(1)	(2)	(3)	(4)	(5)
Greenbook inflation	1.73***	1.73***	1.59***	1.68***	1.45***
	(0.12)	(0.12)	(0.12)	(0.13)	(0.12)
Greenbook output gap	0.67***	0.67***	0.63***	0.67***	0.71***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Greenbook growth	−0.10	−0.10	−0.06	−0.09	−0.08
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Hawk-Dove Balance					
d(HD)		0.09***			
		(0.03)			
Supermajorities Hawk-Dove Balance					
Dove, HD			−0.79***		
			(0.23)		
Hawk, HD			−0.22		
			(0.21)		
Education					
Fresh Ph.D.-Salt Ph.D.				0.07*	
				(0.04)	
Birth					
before GD-after GD					0.31***
					(0.09)
during GD-after GD					−0.16***
					(0.06)
R^2	0.893	0.896	0.907	0.895	0.904
s.e.e	0.711	0.705	0.668	0.706	0.679
AIC	2.182	2.171	2.068	2.172	2.100
SIC	2.259	2.268	2.184	2.269	2.217

Notes: Columns 1 to 5 present least squares estimates for several Taylor Rule, for the period 1987:11–2007:06, at the FOMC meeting frequency (158 observations). All regressions include a constant. d(HD) refers to the first difference of the Hawk-Dove balance. Super-majorities Dove and Hawk are the dummy variables as defined in the text. Newey-West HAC standard errors are reported in parentheses. *** Significant at the 1 percent level. ** Significant at the 5 percent level. * Significant at the 10 percent level.

increase in the HD balance, raises the FFR by 35 (0.9*3.9) basis points. Results are striking when we consider hawk and dove supermajorities (column 3): a move to a strong dovish majority reduces the FFR by 80 basis points. Interestingly, under the effect of dovish supermajorities, the estimates on inflation forecasts change also, i.e., they are lower than in the basic specifications (1.59 compared with 1.73). This suggests that a strong dovish FOMC entails an easier policy in itself as well as an easier "hand" on inflation. This result supports the idea in Christiano et al. (1999), linking changes in the relative weights of inflation and unemployment to changes in FOMC preferences.

The estimate for the hawkish super-majority dummy is statistically not different from zero. In our sample, the hawkish super-majorities appear short-lived or correspond with periods like the 1990 Gulf War, and the war-related recession, the 1997 financial crisis in East Asia and the 1998 financial crisis following the Russian default. As Goodfriend (2002) has argued, in response to these events the Federal Reserve decreased rates significantly or postponed raising them.

In addition, we observe that the specification of the Taylor rule with supermajorities is also statistically preferred to the baseline specification that abstract from the FOMC composition (column 1), in terms of the goodness-of-fit measure (R^2), in terms of precision of mean estimates (lower standard error of the regression, s.e.e) and the AIC and SIC information criteria.

A Taylor rule augmented with FOMC early-life experience. Column (4) in Table 3 shows the estimates from Eq. (2) where $CompFOMC_t$ is expressed as the balance of "freshwater" and "saltwater" Ph.D. graduates in the FOMC. We find that a higher balance is associated with a higher FFR. Thus, having graduated from a "freshwater" or a "saltwater" type of school matters for shaping hawks and doves and ultimately for shaping monetary policy.

Column (5) shows the estimates where $CompFOMC_t$ is represented in terms of cohorts born before, during and after the Great Depression (GD). In this estimation we consider the balance of the "before GD" and "during GD" cohort relative to the "after GD" cohort.[24] We observe that a higher difference between the "before GD" relative to the "after GD" cohort is associated with higher (30 basis points) FFR. Conversely, a higher difference between the "during GD" relative to the "after GD" cohort is associated with lower (16 basis points) FFR. In addition, the estimate for the reaction to the inflation (output gap) is reduced (increased) to 1.45 (0.71) compared with the baseline estimates in column (1). The statistical fit is improved.

Results hold when we extend the sample to the early 80s or the late 60s (see Table B.1 in the Appendix). The estimate for the "freshwater" vs. "saltwater" variable is the strongest when the sample starts in the late 60s, reflecting times when

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[24] This choice is motivated by the previous analysis, showing that the "after GD" cohort is more uniform in hawks and doves, while the two others have an opposite composition, predominantly hawkish for the "before-GD" cohort and predominantly dovish and swingers for "during-GD" cohort.

the divide between these schools of economic thought was stronger. When considering the composition of the FOMC in terms of birth cohorts, results are strongest for the period starting in 1981, reflecting the fact that only during the early 80s do we have relatively mixed cohorts in the FOMC (see Fig. 5). This is not the case for the sample starting in 1969 when the FOMC was almost entirely composed of members born before the GD, therefore we omit this estimation from our analysis.

We compare the fitted FFR from the baseline specification (column 1) with the FFR implied from the rule with superma-jorities (column 3) and find that the FFR is predicted to be larger under periods with hawkish super-majority and smaller under a dovish super-majority, than the state of the economy would suggest (the baseline FFR). Similarly, interest rate cuts are predicted to be larger and faster under a dovish super-majority. In turn, this suggests that, Taylor rules abstracting from the role of the FOMC composition would imply larger (tighter or looser) monetary policy shocks (see Fig. B.1 in Appendix B).

We observe that periods when the Taylor rule with super-majorities has a better fit with the FFR (such as the late 1990s and 2001–2003), correspond to periods when there are shifts in supermajorities (Fig. 6). These shifts, in turn, took place exactly in the first meeting of the year with a new composition of voting members, reflecting the standard annual rotation of four FRB presidents with voting rights. For instance, on February 1999, three doves and one hawk received voting rights in the FOMC, substituting for four hawks from the FOMC of 1998. From the latter group, three were also "freshwater" Ph.D. graduates. In the meantime, there was no change in the composition of the Board of Governors from the last meeting of 1998 to the first meeting of 1999 (the FOMC had 11 members in this period).[25]
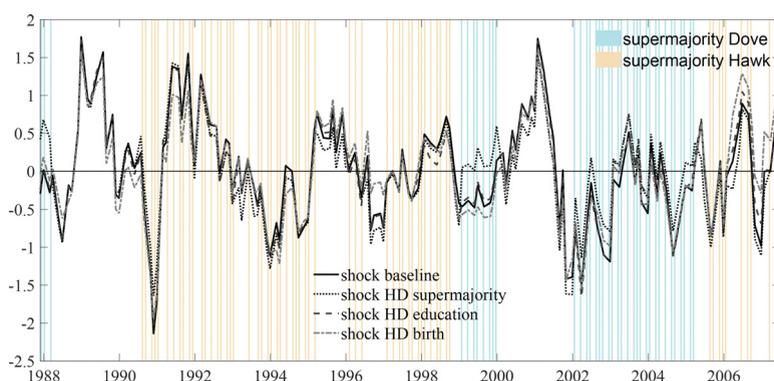

Fig. 6. Residuals from several Taylor rule specifications. *Notes:* This figure plots the actual target FFR minus the predicted FFR from Eq. (2) and estimates in Table 3. Data are at FOMC meeting frequency, sample period is 1987:11–2007:06.

Similarly, in 2002 the FOMC composition moved to a strong dovish majority, with the shift occurring at the first meeting of 2002 with the rotation of FRB presidents. The dovish arrivals from the rotation were further strengthened by the depar-ture of a hawkish Board member (Kelley), which reversed the composition from weak hawks to a supermajority of doves. The latter was further solidified during the year with the departure of the last hawkish Board member (Meyer) and the arrival of two new Board members (Bernanke and Kohn) who were perceived as doves. These results suggest that changes in the FOMC composition, especially due to the rotation of the voting rights, can be a source of exogenous variation for Fed's monetary policy.

Finally, to understand the magnitude of the effect of the FOMC composition on policy we performed several counterfac-tuals using our Taylor rule estimates as shown in Table 3. For instance, we calculate the path of the FFR, assuming the FOMC is composed solely of freshwater Ph.D. or saltwater Ph.D., or it has only dovish or hawkish supermajorities and so on.[26]

Figure 7 shows a large variation between the path of the FFRs implied from these scenarios. The fitted FFRs from the rules assuming only FOMC members born solely before the Great Depression or during the Great Depression are on the extremes, with more than 5% FFR difference, ceteris paribus. In addition, we observe that an FOMC composed solely of freshwater Ph.Ds would also have implied a much tighter monetary policy than the realized FFR. Conversely, the FOMC composed solely of dovish supermajority or saltwater Ph.Ds would imply an easier policy. Interestingly, the FFR under a "Saltwater" FOMC would have reached the zero lower bound during the period 2003–2004, while the FFR under a "freshwater" FOMC would have hovered at around 2%.

Overall, our findings suggest that the variations in the FOMC composition can explain time variation in Taylor rule reac-tion coefficients and FFR deviations beyond what the state of the economy suggests. Inflation and output gap forecasts get

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[25] The FRBs taking voting rights in 1999 were: the Federal Reserve Bank of Philadelphia, the Federal Reserve Bank of Chicago, the Federal Reserve Bank of Dallas and the Federal Reserve Bank of Minneapolis. Only the latter was perceived to have a hawkish president at the time. The new rotation substituted for the Federal Reserve Bank of Boston, the Federal Reserve Bank of Cleveland, the Federal Reserve Bank of Dallas and the Federal Reserve Bank of Kansas City, presidents of which were all perceived as hawks at the time.

[26] These counterfactuals assume everything else remains equal and abstract from equilibrium effects, where the economy might have evolved differently under this path of policy, and policy as well, consequently.
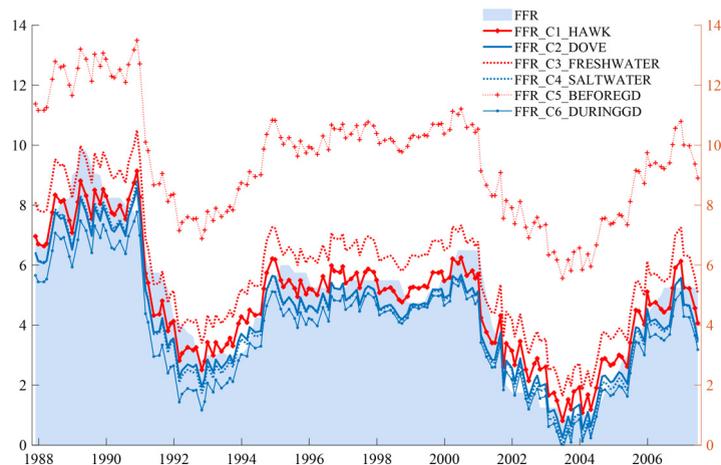
Fig. 7. Predicted FFR under counterfactual FOMCs. *Notes:* The figure plots predicted FFR from six counterfactual Taylor rules. Counterfactual Hawk (Dove) represent results where dummy for Hawk (Dove) supermajorities equals 1, for the entire sample. Counterfactual Freshwater (Saltwater) where the number of freshwater (saltwater) Ph.D. FOMC members is 12 (the maximuml of voters), for the entire sample. Counterfactual BeforeGD (DuringGD) where the number of members born before (during) the Great Depresion is 12 (the maximum of voters) for the entire sample. The shadow area represent the realized FFR. Data are at FOMC meeting frequency, sample period is 1987:11–2007:06.

different weights when accounting for the FOMC composition in terms of strong majorities, graduate education and birth cohorts relative to the post Great Depression period. In addition, the statistical fit of augmented Taylor rules is better than the rule with Greenbook forecasts only. Our results support the importance of ideas, whether from graduate education or earlier life experience, in the Fed's monetary policy setting. Notably, these results echo the argument of DeLong (1997) and the comment of John Taylor in DeLong (1997) about the truest cause of the Great Inflation. While DeLong (1997) links the inflation to the policies undertaken on the recommendation of Keynesians in the 1960s, and more generally to the memories of the high unemployment in the Great Depression, Taylor argues more in favor of the economic theories prevalent at the time.

4.1.1. Robustness analysis

In the following, we discuss several sensitivity checks with respect to the specification of the Taylor rule and when the data sample is extended to the early 1980s, a period in which the FOMC decision-making process was not too different.

Inflation experiences Malmendier et al. (2020) have shown that the experience-based inflation forecasts of the voting members present at the FOMC meeting can tilt the FFR away from the Fed's staff's Greenbook forecasts. Table B.2 in Appendix B shows results when we augment the Taylor rule as in Eq. (2) with the measure of the inflation experience, as constructed by Malmendier et al. (2020).[27] We observe that the inclusion of the inflation experience lowers the estimated sensitivity of the FFR to the staff's Greenbook inflation. In addition, we find that all our results concerning the role of the composition of the FOMC in terms of hawks and doves, the "freshwater" vs. "saltwater" Ph.Ds, and in terms of the birth cohorts hold. The FOMC composition explains the FFR above and beyond the state of the economy and the experience-based inflation forecasts of the FOMC members. This finding confirms that the formative years of the FOMC members matter.

Interest rate smoothing In this version, we consider augmenting the Taylor rule as in Eq. (2) with interest rate smoothing and with persistent monetary shocks as in Coibion and Gorodnichenko (2012). Table B.3 in Appendix B shows that the estimate of the HD balance remains significant in all specifications. Interestingly, results with data from the early 1980s, including the Volcker disinflation period, show higher estimates for inflation and for the HD balance. This suggests a tougher "hand" on inflation and stronger power from the hawks (columns 5 and 6).

In addition, the results are also robust to purging the variation in the Hawk-Dove balance that is explained by the state of the economy and using the residuals in several versions of forecast-based Taylor rules (Table B.4 in Appendix B).

Interaction terms We also estimate an alternative specification of the Taylor rule, where the HD balance, and the deep determinants, interact with Greenbook forecasts of inflation and the output gap, respectively (Table 4). Results from this analysis support our main findings, as follows: i) the FOMC composition accounts for different estimates of the reaction coefficients to inflation and the output gap in the Taylor rule, ii) the reaction coefficient to inflation forecasts is more sensitive to the FOMC composition than those to the output gap, iii) the effects of the FOMC composition are non-linear, as supermajorities have a stronger effect both on the reaction coefficients and the fit of the model, compared with simple majorities.

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[27] We are grateful to the authors for sharing this data with us.

Table 4
Taylor Rules, FOMC composition as interaction terms, 1987–2007.

Variables	(1)	(2)	(3)	(4)	(5)
Greenbok Inflation	1.78***	1.78***	1.71***	1.81***	1.72***
	(0.11)	(0.11)	(0.10)	(0.11)	(0.13)
Greenbook Output gap	0.65***	0.65***	0.71***	0.61***	0.41***
	(0.05)	(0.05)	(0.06)	(0.09)	(0.10)
Hawk-Dove Balance					
Inflation*d(HD)		0.03*			
		(0.01)			
OutputGap*d(HD)		−0.02			
		(0.01)			
Supermajorities Hawk-Dove balance					
Inflation*Dove			−0.35**		
			(0.15)		
Inflation*Hawk			−0.13		
			(0.08)		
OutputGap*Dove			0.01		
			(0.07)		
OutputGap*Hawk			−0.17**		
			(0.08)		
Education					
Inflation*(FreshPh.D.-SaltPh.D.)				0.04**	
				(0.02)	
OutputGap*(FreshPh.D.-SaltPh.D.)				−0.01	
				(0.02)	
Birth					
Inflation*(beforeGD-afterGD)					0.08*
					(0.04)
OutputGap*(beforeGD-afterGD)					−0.09**
					(0.04)
Inflation*(duringGD-afterGD)					−0.04
					(0.03)
OutputGap*(duringGD-afterGD)					0.04
					(0.03)
R^2	0.888	0.890	0.907	0.893	0.906
s.e.e	0.724	0.724	0.671	0.714	0.672
AIC	2.213	2.223	2.083	2.196	2.088
SIC	2.271	2.320	2.219	2.293	2.223

Notes: Columns 1 to 5 present least squares estimates for different specifications of the Taylor Rule, estimated for the period 1987:11–2007:06, at the FOMC meeting frequency (158 observations). All regressions include a constant. d(HD) refers to the first difference of the Hawk-Dove balance with equal weight for all FOMC members. Super-majorities Dove and Hawk for different weights in the HD balance are the dummy variables as defined in text. Fresh Ph.D.-Salt Ph.D. denotes the difference between the number of "freshwater" and "saltwater" Ph.D. graduates and born before, during GD and born after GD denote the respective differences of the composition of the FOMC in terms of cohorts born before GD and during GD relative to after GD cohort. Newey-West HAC standard errors are reported in parentheses.
*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.

More specifically, interaction estimates are statistically significant for inflation but not for the output gap. The most striking is the version of the Taylor rule with supermajorities (column 3), where the reaction coefficient of inflation is lower than in the previous versions (1.71 versus 1.78) and the interaction term with the dovish supermajority lowers it further to 1.36 (1.71-0.35). Thus, a move of the FOMC to a dovish supermajority makes the FFR significantly less responsive to inflation. In contrast, a move to a hawkish supermajority reduces significantly the response of the FOMC to the forecasted output gap.

When looking at specifications with Education and Birth interactions (columns 4 and 5), we confirm that a higher share of "freshwater" graduates to "saltwater" graduates increases the weight of inflation in the reaction function. Similarly, a higher share of the "before GD" cohort relative to the "after GD" cohort increases the weight of inflation and lowers the weight of the output gap (column 5). Results with birth cohorts (available on request) are more striking for the sample period starting in 1981. They confirm the results for the "before GD" cohort and show in addition that a higher difference of the "during GD" cohort relative to the "after GD" cohort is associated with a lower weight of inflation in the Taylor rule. Overall, these findings confirm that the composition of the FOMC has two effects, (i) it explains time variation in Taylor rule reaction coefficients and, (ii) it explains FFR deviations beyond what the state of the economy suggests.

Fed Chair preference While the Chair has only one vote among the other 12 (or less) FOMC members, it can exert more power in the decision making process by controlling the agenda of the Board and FOMC meetings and by forging a consensus

among the FOMC members (Blinder, 2004). Several studies have discussed the power of the Fed Chair. For instance, Chappell et al. (2005) estimated that the econometric weight of the chairman Arthur Burns on policy decisions was approximately 40 to 50%, and Blinder (2004) regards the FOMC as an "autocratically collegial committee", specifically referring to Greenspan as a Fed Chair that "led the FOMC with a velvet glove, not with an iron fist". The FOMCs led by Bernanke and Yellen have been perceived to be on the collegial side. Riboni and Ruge-Murcia (2010) have argued that a consensus model, where a supermajority is needed to move policy, fits actual policy decisions of the Federal Reserve better. Moreover, Riboni and Ruge-Murcia (2020) argue the data from 1974 to 2008 prefer a version of their model where the chair is moderately inclusive over a dictator model.

We find very similar results, both qualitatively and quantitatively, when taking into account a higher weight of the Fed chair preference (see details and results in Table B.5 in Appendix B. Interestingly, the goodness of fit indicators of the model prefer Taylor rules with the HD composition with equal weight on FOMC members.

Overall, these sensitivity checks show that the Hawk/Dove balance is important both statistically and economically, suggesting that the policy preferences of FOMC members and the deep determinants that we consider, matter in interest rate setting.[28]

One wonders, how do FOMC members express these preferences and ideologies and influence monetary policy? In the case of the Fed Chair, his/her input on policy setting is clear via his/her influence as an agenda setter and consensus builder. For the other members, while there may be countless ways through which they can push for their policy preferences, we believe that the most likely way is through their individual forecasts of the economy and through expressed support or not (disagreement and eventually dissent) for policy alternatives put on the table. Findings in the existing literature support these channels. For instance, Romer and Romer (2008) documented that individual FOMC member's forecasts have worse predictive power than Greenbook forecasts and these differences help predict monetary shocks. Moreover, Istrefi (2019) has shown that hawks and doves differ in terms of their individual forecasts, preferred interest rates (as expressed in FOMC meetings) and dissents. In Table B.6 in Appendix B, we also show that "freshwater"-Ph.D. dissent in a larger proportion for tighter policy and have a higher share of dissents per member (about 4.2 dissents per member). Moreover, we observe that members born during the Great Depression have dissented more on the side of easier policy than FOMC members born before or after.

5. Concluding remarks

In this paper, we highlight two important factors in molding the policy preferences of FOMC members who have served in the past 60 years: ideology by education, and events that shaped their early lives before joining the FOMC. Obviously, there are other factors that we have not discussed. We find that having studied at a "freshwater" rather than a "saltwater" university seems to give cleaner answers to explaining differences in preferences among these members. These factors seem to matter not only for the molding of the policy preferences of individual members but also for the overall composition of the FOMC and for its monetary policy-setting. Whether these factors have important implications for market expectations and for macroeconomic outcomes we leave for future research.

Our results have important implications both for the politics of the confirmation process for Federal Reserve governors in the U.S. Senate and for the supposed policy neutrality of FOMC members. While ideally these members should be chosen strictly on merit (expertise), we notice that as the political divide gets wider, as has been the case in recent years, the hawk or dove signals become more important in the confirmation process.

We find that the hawk-dove balance and its deep determinants mattered significantly in the 1980s to 2000s in determining policy rate changes and, particularly, the weight that it is assigned to inflation in the Taylor rule. Will this balance be as important moving forward? Since the late 1980s there has been a considerable convergence between the two schools of thought, with "saltwater" elements included in "freshwater" models, and vice versa. Ideological factors may also have become muted with time because the Federal Reserve, as is the case with many central banks around the world, has converged to an understanding of the importance of price stability (and the use of flexible inflation targeting).

Nevertheless, the Fed's new policy strategy of average inflation targeting announced in 2020, the Fed's response to the COVID-19 pandemic crisis, and the 'too little, too late' response to the burst of high inflation during 2021–2022, bring to the fore the issues raised in this paper. While not covered in our analysis, a preliminary update of the Hawk-Dove composition shows a strong and persistent dovish majority in the FOMC for the period 2009–2021 (Fig. A.2 in Appendix A). The FOMC turns hawkish only in 2022, 14 years later since the last hawkish FOMC in 2008. This is the longest period with a dovish FOMC that we observe since the 1960s. To put it in perspective, the second longest period of a dovish FOMC in our sample is about five years and happened in the second part of the 1960s, when the Great Inflation of the 1970s started. Our analysis showed that the response of the FFR to forecasted inflation is significantly lower when accounting for (strong) dovish majorities. Thus, our findings may add to the hypotheses and the explanations put forward in the literature for why the Fed

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[28] One may think of additional potential factors affecting the FOMC voting, like seniority of the FOMC members or the mix of regional Feds with different characteristics, among others. While our aim is to look at determinants (education and big events in birth years) with timing before the FOMC years, our numerous Taylor rule specifications indirectly cover these factors too. For instance, we cover age through the cohort effect and the role of regional Fed characteristics through the dove and hawk measure, which as discussed above, is also linked to the different Reserve Bank institutional philosophies.

failed to prevent the burst of inflation. These developments suggests that the composition of the FOMC may continue to have significant effects on the policy debate, and ideology may still play a role.

Data availability

Data will be made available on request.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmoneco.2023.03.001.

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