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Central Bank Governance in Monetary Policy Economics (1981-2020)

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The aim of the paper is to shed light on how two factors – central bank’s design and central bankers’ preferences – progressively assumed a crucial role in the evolution of monetary policy economics in the last four decades. The two factors jointly identify the importance of central bank governance in influencing monetary policy decisions through their interactions with the monetary policy rules, given the assumptions about how macroeconomic systems work.

Keywords: monetary policy, central bank independence, central banker conservatism, monetary policy committees, political economics, behavioural economics.

JEL Codes: E50, E52, E58.

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1. Introduction

As monetary policy economics evolved over the last four decades, two intertwined tales played crucial roles. On the one hand was the tale of how the institutional design of central bank rules – the procedures that govern central bankers' decisions – can shape policymakers' incentives (Sargent and Wallace, 1981). On the other hand was the tale of how central bankers' preferences matter (Barro and Gordon 1983, Rogoff 1985). Central bankers' preferences and central bank design have progressively emerged as two crucial features of central bank governance that can shape monetary policy. By the time of the 2008 Great Crisis the even more relevant role of monetary policy has rekindled the debate on central bank governance.

Before the 1980s, macroeconomics did not pay explicit attention to either central bankers' preferences or the central bank's institutional setting when developing positive and normative arguments. Both features were hidden. This reflected the "**rules versus discretion**" dilemma regarding the optimal conduct of monetary policy (Bibow 2002, Rivot 2013, Tavlas 2014 and 2019, Dellas and Tavlas 2016, Nakamura and Steinsson 2019), which was based on Poole's (1970) theoretical framework in which what mattered was the combination of policy conduct with the stochastic nature of the world. That dilemma still offers key insights (Nelson 2007, Bibow 2010, Taylor 2011) that highlight two relevant evolutions in monetary policy analysis.

First, as Rivot (2013) points out, the concepts of "rule" and "discretion" are viewed differently today. A "rule" is a systematic policy reaction function (Taylor 1993). The dilemma is how much discretion the central banker has in applying a policy. In other words, the crucial question is the following: "What is the optimal discretionary rule?". Second, in the 1980s, the discretionary policy rule became intertwined with two other features: the central bank's design and central bankers' preferences, which jointly define the central bank's governance. The central bank's governance deeply influences the discretionary policy rule and, eventually, monetary policy.

In the traditional debate, the design of the central bank's governance did not matter for several reasons. On the one hand, as Rivot (2013) highlights, Friedman (1962) generally distrusted collective bodies and consistently advocated for constitutional rule in the monetary policy field in order to completely tie central bankers' hands. On the other hand, as Bibow

(2002) and Rivot (2013) note, Keynes (1971, <1930>; 1982,<1932>) viewed the government as the monetary policymaker that sets the goals for monetary policy. As such, the central banker's preferences do not matter. At the same time, the central bank's design does not have special status with respect to other public agencies. In fact, both features – central bankers' preferences and central bank design – are proxies for the importance of monetary stability in policy makers' goal functions. However, if the monetary policymaker is the government, then the central bank's governance is irrelevant.

Moreover, in the Keynesian view, the central bank is a technical body that retains discretion in implementing the day-to-day policy, and the need for cooperation between the central bank and the treasury is stressed (Bibow 2002, Rivot 2013). However, in this perspective, the need for cooperation is defined in a set of rules that govern the hierarchical relationship between the monetary policymaker (i.e. the government) and an expert bureaucracy (i.e. the central bank). In other words, the central bank's design is likely to be no more than an application of the general rules that govern the interactions between the political principal and its administrative bureaucratic agents.

Our narrative begins when the roles of both central bankers' preferences and the central bank's design emerged through the application of a **game theoretical** approach following the discovery of the general **time-inconsistency** problems that characterize economic policy (Kydland and Prescott 1977, Calvo 1978). The key feature was the identification of the relationship between the political cost-benefit analysis of any incumbent government and the likelihood of a sub-optimal macroeconomic equilibrium. In this context, either an **independent central bank** (Sargent and Wallace 1981, Barro and Gordon 1983) or a **conservative central banker** (Rogoff 1985) were identified as the solution to the problem of monetary policy effectiveness. At the same time, both concepts highlighted the importance of monetary stability in policy makers' goal functions.

The importance of central banker conservatism on the one hand and central bank independence on the other hand took centre stage. The roles of central bankers' preferences and central bank design became increasingly intertwined and, eventually, the two were merged. The contemporaneous and explicit roles of both factors has been recognized in the literature on **monetary policy committees**, which emerged in the 2000s following Chappel et al.'s (1993) seminal contribution.

In this strand of literature, the incentives of central bankers with heterogeneous preferences are analysed by considering them as bureaucrats who use the central bank's governing bodies (i.e. the committees) to make monetary policy decisions. The most recent step has been to explore the role of **psychology** in shaping central bankers' preferences and, consequently, the decisions of the monetary policy committees.

A close of reading the literature focused on the nexus between central bank governance and monetary policy can be useful in interpreting current events, especially as the economic and political importance of central banks in advanced economies has grown since the outbreak of the 2007-2008 **Great Financial Crisis** (Buiter 2014, Ueda and Valencia 2014, Draghi 2018). Supervisory and regulatory responsibilities have been piled onto central banks, thereby intensifying the relationships among banking, fiscal and monetary policies (Bayoumi et al. 2014, Barthelemy and Plantin 2018, Gavin 2018). The boundaries between the central bank's role as liquidity manager and the government's solvency support for banks and financial institutions have been blurred, inevitably triggering a debate on the shape of central bank regimes (Nier 2009, Cecchetti et al. 2011), especially with regard to the **central bank's independence** (Alesina and Stella 2010, Cukierman 2008 and 2013, Cecchetti 2013, Stiglitz 2013, Taylor 2013, Buiter 2014, Balls et al. 2016, Sims 2016, Blinder et al. 2017, De Haan and Eijffinger 2017, Issing 2018, Orphanides 2018).

In analysing the evolution of the relationships between monetary policy economics and the central bank setting, **a series of studies** (Cukierman 1994, Romer and Romer 1997, Bibow 2004, Alesina and Stella 2010, Howitt 2012, Parkin 2012, Cukierman 2013, Reis 2013, White 2013, Blancheton 2016, De Haan and Eijffinger 2016, Hartwell 2018, Castillo-Martinez and Reis 2019, Wachtel and Bleier 2019) offer fundamental contributions and interesting insights. However, none of these articles view the nexus between central bankers' preferences and the central bank's design as the key to the evolution of the extant literature since the 1980s.

The paper is organized as follows. Section Two discusses how economic thought on monetary policymaking shifted to focus on the key issues of central bank conservatism and central bank independence, which jointly define the central bank's governance. Section Three covers the further development of the analysis of central bank governance, including the recognition that while central bankers' preferences can be heterogeneous, the governance investigation must be more granular given that monetary policy decisions are made by

collective decision bodies (i.e. monetary policy committees). In, Section Four, we review how monetary policy phenomena can be interpreted when behavioural distortions affect central bankers' preferences. Our conclusions are presented in Section Five. In the Appendix, the review perspective adopted here is presented using a monetary policy model.

2. The Starting Point: Discovering the Role of Central Banker Conservatism and Central Bank Independence

Until the 1980s, macroeconomic theory did not assign importance to the concepts of central bankers' preferences or central bank design, which later became the key features of central bank governance that could influence monetary policy decisions. Central bank governance became increasingly important as economic analyses started to stress its role in determining macroeconomic performance (i.e. during the New Classical Revolution). This role was confirmed in New Keynesian analyses of monetary policy, which were usually based on the dynamic stochastic general equilibrium (**DSGE**) framework (Woodford, 2003a).

The theoretical setting can be summarized as follows: policymakers tend to use monetary tools with a **short-sighted perspective**. More specifically, they use the inflation tax to smooth different kinds of macroeconomic shocks – real (Barro and Gordon 1983¹) and fiscal (Sargent and Wallace 1981², Barro 1983³) imbalances. In this regard, they try to exploit the trade-off between real gains and nominal costs. Assuming that the policymakers are politicians who act as career-concerned players, the basic intuition is that two sources of instability exist (Alesina and Gatti 1995): the **economic variability** induced by macroeconomic shocks that monetary policy is supposed to address, and **political variability** related to electoral or ideological goals.

However, the more the markets are efficient and the agents are **rational** (Muth 1961), the greater the risk that short-sighted monetary policies produce only nominal distortions, such as inflation and bubbles in real and/or financial prices. Rational private agents fully anticipate the political incentives to use the inflation tax and fully adjust the nominal variables. The more

¹ "We assume that some benefits arise when the inflation rate exceeds the anticipated amount. (...) Here unanticipated monetary expansions (...) lead to increases in real economic activity." p.103.

² "If the fiscal authority's deficits cannot be financed solely by new bond sales, then the monetary authority is forced to create money (...)" p.2.

³ "The government likes more revenues from money creation – perhaps because the alternative are either extra revenues obtained from distorting taxation or less (valuable) public expenditures" p.4.

such assumptions are considered valid, the more likely it becomes that the Friedman-Lucas proposition on **monetary policy neutrality** will hold (Friedman, 1968; Lucas, 1973).

Therefore, banning the use of monetary policy for myopic political purposes becomes the social goal and central bank governance takes the stage. The relationship between the policymaker, who designs the overall economic policy, and the central bank, which is usually the technocratic agent responsible for the monetary policy, becomes crucial for avoiding monetary policy bias. The **rules of the game** between policymakers and central bankers as well as the preferences of the players gain momentum (Sargent and Wallace 1981⁴, Barro and Gordon, 1983; Backus and Driffill, 1985; Rogoff, 1985; Lohmann, 1992).

The **game theoretical** approach to monetary policy (Barro and Gordon 1983, Backus and Driffill 1985⁵) was adopted with the aim of overcoming the weakness of traditional monetary policy models that Lucas (1976) highlighted – the assumption that the macroeconomic environment is given. Later, a **principal-agent** approach (Walsh 1993⁶) was developed in which an institutional contract is defined such that it induces the central banker to implement the optimal monetary policy. In this vein the monetary policy delegation to non-elected central bankers has been definitely motivated showing that **bureaucrats** are preferable to politicians in technical policy, while for pure redistributive policy elected politicians retain such tasks under their direct control to please their voters (Alesina and Tabellini 2007).

Notably, in initial models of the monetary policy framework, **central bank independence** (Sargent and Wallace 1981⁷) and **central bankers' conservatism** (Rogoff 1985⁸) were used as proxies for the importance of monetary stability in policy makers' goal functions. Increasingly, researchers have acknowledged that independence and conservatism are **different concepts** (Eijffinger and Hoeberichts 1998⁹, Hughes Hallet and Weymark 2005,

⁴ "The question is, Which authority moves first, the monetary authority or the fiscal authority? In other words, Who imposes discipline on whom?" p.7.

⁵ "By treating policy as a dynamic game (...) we avoid the "inconsistency of optimal plans" that has plagued studies that view policy as an optimization problem" p.530.

⁶ "(...) in dealing with a central- bank head, a government can directly affect the central banker's objective function and incentives in many ways. (...). Such institutional aspects of the central bank's structure (...) can be thought of as representing a "contract" between the government and the monetary authority" p.151.

⁷ " (...) imagine that monetary policy dominates fiscal policy. Under this coordination scheme, the monetary authority independently sets monetary policy (...). " p.1.

⁸ " We demonstrate that society can make itself better off by selecting an agent to head the independent central bank who is known to place a greater weight on inflation stabilisation (...)" p.1177.

⁹ "Central bank independence is included in the model of conservative central banker (...)" p.397; " (...) a lack of central bank independence can be compensated by choosing more conservative central bankers" p. 399.

Eijffinger and Hoeberichts 2008, Hefeker and Zimmer 2011, Darabi and Samimi 2016). Independence is as an **institutional feature** of the monetary regime, while conservatism is a **personal attitude** of the central banker and a key feature of the monetary policymaker. Many studies have found that it is optimal to hire a central banker who is more conservative than the average citizen (Rogoff 1985, Herrendorf and Lockwood 1997, Hughes Hallet and Proske 2018). This, in turn, reflects a **principle** stated as early as the 1960s (Brainard 1967).

The relationship between conservatism and independence has been addressed using independence as a tool for implementing conservative monetary policies. **Central bank governance** became the institutional architecture for implementing day-to-day monetary policies aimed at smoothing business cycles (Bernanke and Gertler, 1995; Clarida, Gali and Gertler, 1999; Woodford, 2003b; Gali and Monacelli 2005) using **monetary policy rules** (Taylor, 1993; Henderson and McKibbin 1993; Walsh, 1995, Orphanides A., 2003), where the operating lever can be either a nominal interest rate (Taylor 1993), a quantitative target (Mc Callum 1978), or both (Curdia and Woodford). In fact, monetary policy became the final outcome of complex interactions among four main components: monetary institutions, central bankers' preferences, policy rules and macroeconomics (Persson and Tabellini, 1993; Svensson, 1995). In this regard, both central bankers' preferences and the central bank's design can influence the definition and implementation of the monetary policy rules given the assumptions about how the macroeconomic system works. In a sense a **four-pillar framework** was born.

In this respect, institutional arrangements and policy rules are **not** necessarily **alternative options**, as Friedman claimed in 1962 and Taylor suggested in 2013¹⁰. At the same time, the role of central bank governance has been analysed by considering its interactions with **other monetary-commitment devices**, such as fixed-exchange regimes (De Haan et al. 1993, Hayo and Hefeker 2002, Bodea 2010 and Bodea 2014, Ftiti et al. 2017), currency boards (De Haan et al. 2001) and dollarization rules (Drazen 2002).

A common feature of this stream of literature has been the systematic application of the rational expectations assumption. More recently, **other assumptions on expectations** has been explored: bounded rationality (Hommes 2011, Lengnick and Wohltmann 2016, Gabaix

¹⁰ "In his 1962 essay (...) Milton Friedman discussed three alternative institutional arrangements through which governments can exercise responsibilities for monetary policy: a commodity standard, an independent central bank, and legislated rules. (...) In the half century since Friedman wrote that essay we have accumulated more information about these alternatives." p.155.

2020), heterogeneous rationality (Massaro 2013, Di Bartolomeo et al. 2016, Goy et al. 2020) and beliefs (Henckel et al. 2011, Catalano and Di Guilmi 2019, Proano and Lojak 2020).

In parallel, central bankers' preferences are treated as general common knowledge. Originally (Rogoff 1985) the central banker preferences with respect to conflicting macroeconomic goals were perfectly identifiable ex ante. The presence of **uncertainty** about the central banker's type (Backus and Driffil 1985, Cukierman and Meltzer 1986, Vickers 1986, Beetsma and Jensen 1998, Lossani et al. 1998, Muscatelli 1998, Tabellini 1988, Tillman 2008, Sorge 2012, Morimoto 2018), can modify the results in terms of conduct and performance of monetary policy. Moreover uncertainty about macroeconomic trends can change the optimal central banker conservatism (Tillman 2014).

All in all, the concept of central bank governance essentially became a **two-sided coin**. On the one side, the central bank has to be independent, such that the central banker has the ability to implement non-inflationary monetary policy without any external (political) short-sighted interference. The central banker acts as a veto player against distortive monetary policies. On the other side, the central banker has to be conservative, where conservatism refers to the importance that the central banker assigns to price stability in relation to other macroeconomic objectives. Conservatism is necessary to ensure that the central banker does not become a source of inflation bias. Independence and conservatism become conditions for implementing credible, non-inflationary monetary policies. Otherwise it is natural to wonder whether cases of political capture and/or bureaucratic capture could trigger deviations of the concrete monetary policy action from the (supposed) long sighted perspective, as it has been well documented for example in an historical case of political pressures for partisan monetary policies (Abrams 2006).

Given these key characteristics of monetary policy settings, researchers have developed a set of **indices** that attempt to capture the institutional features of central bank governance, and gauge their degree of independence and conservatism. The evolution of the literature on central bank governance can be described as a **two-stage** process. Initially, scholars involved in the field verified the theoretical conjectures through comparative, institutional and empirical analyses. After constructing **indices of central bank independence** (Bade and Parkin 1985, Grilli et al. 1991, Cukierman et al. 1992, Alesina and Summers, 1993), academics attempted to determine whether and how the different indices could be considered as **drivers** of the most

important **macroeconomic phenomena**: inflation, public debt, interest rates, income and growth. Most offered *de jure* indices of independence based on central bank charters. One exception was Cukierman et al. (1992), who distinguished between legal and **de facto** indicators of independence. More recently, Vuletin and Zhu (2011) proposed a new, de facto index of independence that identifies two mechanisms embedded in the measure of the turnover rate among central bank governors.

A further step in analysing the relevance of the central bank governance has been realized exploring the **financial central bank independence**. The relevance of the transfers policies between central banks and governments has been first highlighted in Sims (2003 and 2005), beginning a strand of literature that explored the importance of separating the budget constraint of the central bank from that of the treasury, shedding light on the fiscal implications of central bank balance sheet policies (Orphanides 2016).

While Bassetto and Messer (2013) shed light on the fiscal effects of the different shapes of the central bank asset side, Hall and Reis (2015) and Carpenter et al. (2013) have investigated the likely path of the Federal Reserve System's balance sheet during a possible return to historically normal levels of interest rates. Del Negro and Sims (2015) constructed a deterministic general equilibrium model to study the impact of different interest rates scenario on the Fed's balance sheet.

Moreover, Hall and Reis (2015) suggested that every period the central bank should calculate its net income, marking assets to market, and rebate it in full to the Treasury if it is positive, or receive a transfer from the Treasury if it is negative. Reis (2015) discussed that the Fed and the ECB already follow this rule when profits are positive, but the extent to which the fiscal authorities are committed to transfers that cover losses is less clear. Therefore, the fiscal support of these monetary policy institutions is incomplete and their solvency is, at least theoretically, potentially at risk. In parallel, Benigno and Nisticò (2020) analysed the effects on inflation and output of possible income losses on the central bank's balance sheet.

Taking advantage of the first wave of studies on monetary regimes, including the critical views (McCallum, 1995, Bibow 2004), the literature took an important step by beginning to treat central bank governance as an **endogenous variable** that has to be explained. The original theoretical motivation goes as follow: in normal times the policymaker grants independence to a conservative central banker, but in extreme situations – i.e. in extraordinary times – the

politicians retains the option to override the central banker's decisions (Lohman 1992¹¹). The subsequent key intuition is that the government is a politician that can shape central bank governance by taking different drivers into account. They create dynamic institutional cycles that are characterized by ups and downs (Masciandaro and Romelli 2015), during which central bank independence can show different degrees of resilience in terms of how difficult is to change constitutions and laws, and then use those changes to modify the central bank's setting (Alesina and Grilli 1992, Walsh 2000, Giordani and Spagnolo 2001, Blinder 2010). This allowed for exploration of the drivers that can motivate decisions by one or more countries to maintain or reform their monetary regimes. Different interpretative hypotheses were advanced to explain the genesis of the political process that leads policymakers to change their monetary regimes.

More specifically, developments in endogenizing central bank independence have been subject to analyses in both economics and political science. One argument suggests that the degree of central bank independence depends on the presence of constituencies that are strongly averse to the use of the inflation tax, which drives policymakers to bolster the status of the central bank (the **constituency view**; Posen, 1995, De Haan and Van't Hag 1995, Miller 1998, Maxfield 1997). Others argue that an aversion to the use of the inflation tax is structurally written into the features of the overall legislative and/or political system, which influences policymakers' decisions about the independence of the central bank (the **institutional view**; Goodman 1991, Sieg 1997, Vaubel 1997, Moser 1999, Bernhard 1998, Milesi-Ferretti 1995, Lohmann 1997, Bagheri and Habibi 1998, Banaian and Luksetich 2001, Keefer and Stasavage 2003, Acemoglu et al. 2008). Yet another perspective stresses the role of a country's culture and traditions of monetary stability in influencing policymakers' choices (the **culture view**; Berger 1997, Hayo 1998, Franzese 1999, Crowe 2008, Eggertsson and Le Borgne 2010, Hielscher and Markwardt 2012, Berggren et al. 2014). Finally, some research argues that central bank architectures evolve endogenously in response to a set of macroeconomic factors (the **macroeconomic view**; Farvaque, 2002; Aghion et al., 2004; Polillo and Guillen, 2005; Brumm, 2006, 2011; Bodea and Hicks, 2015; Romelli, 2017).

These four views all point to the role of citizens' preferences in determining the degree of central bank independence. In the constituency view, current preferences regarding the use

¹¹ p.273.

of the inflation tax are relevant. In the institutional and culture views, past anti-inflationary preferences influence the policymakers' present decisions. In a way consistent with the macroeconomic view, these preferences might change following periods of economic turmoil, thereby prompting a wave of reforms in the design of the central bank governance.

At the same time, as in the case of central bank independence, researchers developed **indices of central banker conservatism**, where the most accurate analyses discuss or use separate indicators for independence and conservatism (Vaubel 1997, Forder 1998, Fry 1998, Favero and Rovelli 2003, Ozlale 2003, Castelnuovo and Surico 2004, Berger and Woitek 2005, Dennis 2006, Berlemann and Hielscher 2013 and 2016, Levieuge and Lucotte 2014).

Finally, the literature has explored the role of central bank governance as an institutional factor that influences political decisions regarding the banking and financial **supervisory architectures** (Masciandaro 2005, 2007 and 2009, Dalla Pellegrina et al. 2013, Melecki and Podpiera 2013, Masciandaro and Volpicella 2016, Masciandaro and Romelli 2018). In parallel, the degree of central banker conservatism can shape not only economic outcomes, but also political (election) outcomes (Dziuda and Pflueger 2020).

3. Ex Pluribus Unum: Inside the Black Box of Central Bank Governance

Analyses of central bankers' conservatism and central bank independence were just the first steps in attempts to discover the role of central bank governance in monetary policy. Another step was taken when the literature acknowledged that monetary policy is conducted by committees (Blinder and Morgan 2005¹², Gerlach-Kristen 2006). Fry et al. (2000), Pollard (2004), and Lybek and Morris (2004) show that the majority of central banks use **committees**, i.e. boards, including the emergence of "shadow" committees (Siklos and Neuenkirch 2015). This feature of central bank governance can deeply affect monetary policy decisions.

The literature that looks at the link between monetary policy choices and board members' diversity essentially focuses on two issues: i) how monetary policy committees work, and ii) how the composition of committees can shape monetary policy outcomes in which the

¹² "In recent years, central banking practice has exhibited a notable shift from individual to group decision making, that is toward more monetary policy committees." p.789; "Nevertheless, economic theory has had precious little to say on the pros and cons of making monetary policy individually or in groups" p.790.

more disputed issue is related to the degree of activism (i.e. the central bank's preferences for an anticyclical interest rate policy).

In this stream of literature, specific terminology is used. A “**dove**” is a policymaker who likes to implement active/easy monetary policies, while a “**hawk**” is a policymaker who dislikes such policies (Chappell et al. 1993¹³ and 1997, Jung 2013, Jung and Kiss 2012, Jung and Latsos 2014, Eijffinger et al. 2013a and 2013b, Neuenkirch and Neumeier 2013, Wilson 2014, Eijffinger et al. 2015, Istrefi 2017, Bordo and Istrefi 2018, Istrefi et al. 2019).

The degree of activism is related to the role of the interest rate policy as an anticyclical element used to smooth the business cycle. The doves claim that activism improves overall macroeconomic performance, and exploits the trade-off between inflation and output growth from time to time. The hawks assume that the interest rate policy is more effective when it is solely focused on monetary stability. Over time, the dovish/hawkish attitudes have become a main focus in analyses of monetary policy board decisions. Thus far, the conclusions in this stream of literature are relatively heterogeneous.

Using an experimental approach, Blinder and Morgan (2005, 2008) and Blinder (2007) argued that committees can make more efficient monetary policy decisions via **heterogeneity** and **diversity**. Besley et al. (2008), Hansen and McMahon (2008), Gerlach-Kristen (2006 and 2009), Harris and Spencer (2009), Hix et al. (2010), and Eijffinger et al. (2013, 2015 and 2018) claimed that heterogeneity can trigger regularities in monetary policy actions, making it theoretically possible to alter a board's composition in order to drive different monetary policy strategies.

Moreover, among those assuming that heterogeneity matters, special attention has been devoted to the possible role of **personal characteristics**, including regional biases (Meade and Sheets 2005, Jung and Latsos 2014, Farvaque et al. 2018). Gohlmann and Vaubel (2007) looked at a panel of mainly European countries and found that former members of central banks' staffs prefer lower inflation rates than former politicians. Farvaque et al. (2006, 2014) linked inflation outcomes to the biographical characteristics of board members, and found that the age, education and professional experience are correlated with a country's inflation dynamics.

¹³ The distinction was originally made in analysing partisan monetary decisions: “Conventional wisdom suggests that Democratic administrations prefer “easy” monetary policies, while Republican administrations prefer monetary “tightness”” p.186.

More specifically, Gohlmann and Vaubel (2007) tested the hypothesis that the inflation preferences of central bankers depend on their educational and occupational backgrounds. Based on an analysis of panel data for the eurozone and eleven other countries from 1973 to 2003, they found that former members of central bank staff preferred lower inflation rates more than former politicians. Farvaque et al. (2006) linked inflation records in a selected sample of countries with board members' biographical characteristics. They used well-structured panel data covering 13 countries from 1999 to 2003, and found that the age of board members was the most important factor. Moreover the educational and professional background of central bankers has been used to explain which type of economic reform each of them advocated (Bennani 2015).

Harris et al. (2011) questioned the relevance of personal characteristics. First, they showed that the effects of board members' careers and political influence on voting behaviour were negligible. Moreover, they suggested that the entire stream of literature on voting behaviour based on members' internal or external status was overly simplistic. This, in turn, laid the groundwork to account for possible unobserved heterogeneity. In the same vein, Chappell and McGregor (2017) empirically support the view that the committee decisions are "genuinely collegial", given that the individual members seem to place a large voting weight on the preferences of their fellows, but little added weight on the Governor preferences. Smale and Apergis (2016) claimed that features such as education, age and, to a lesser extent, work experience are not important, while the time spent within the central bank, tenure, and the influence of the Governor seem to be more relevant.

Farvaque et al. (2014) performed a similar analysis focused on inflation and output volatility. They showed that the size of the board matters, except during crises, while personal background influences performance, with positive effects evident when board members come from academia, central banks or the financial sector. Malmendier et al. (2020) focused their attention on personal experiences with inflation as a factor that strongly influences the hawkish or dovish leanings of Federal Open Market Committee (FOMC) members.

Chappell Jr. and McGregor (2000) were among the first to draw attention to **gender**. They studied the voting behaviour of FOMC members from 1966 to 1996 and ranked their dovishness/hawkishness. Of the seven women that served on the board during that period, six were among the thirteen most dovish members. In a study of the impact of the composition of

monetary policy committees on the inflation performance of nine central banks from major OECD countries, Farvaque et al. (2011) found an association between lower inflation and higher shares of female members, which implies that women are more hawkish. These authors explained these results in relation to the general trend towards more conservative central banks. In order to be appointed, women need stronger credentials. In this case, a hawkish reputation – both before the member’s appointment and during her tenure – would qualify. Gender has also been used to explain dissenting votes on monetary policy committees. Bennani et al. (2018) looked at the Fed’s monetary policy decisions from 1994 to 2008 and found that female members appeared to exhibit more dissenting attitudes (see also Lahner 2018).

Masciandaro et al. (2018) investigated the impact of the presence of women on monetary policy committees by estimating Taylor rules augmented to include the share of women on these committees. Their empirical results showed that central bank boards with higher proportions of women set higher interest rates for the same level of inflation. This confirms that female board members adopt a more hawkish approach to monetary policy. Along similar lines, Diouf and Pepin (2019) showed that female central bank chairs focus more than their male counterparts on achieving price-stability goals. On the other hand, Ainsley (2019) used matching methods to show that in the Fed’s votes and discourse, where there is no evidence that women vote differently from their male colleagues, monetary policy committees with one or more female members devote more discussion to employment issues. Moreover, they vote in favour of more expansionary monetary policies, suggesting a dovish attitude. Finally, Bodea (2018) examined the factors that drive the gender balance in central banks’ boards. She found that gender diversity is more likely in larger boards, when national legislatures include more women and when the central bank has more independence.

More generally, the exploration of the drivers of the board’s composition and its effects on the monetary policy profile is a political economy issue that considers the role of **preferences** in defining the monetary policy stance. The preferences that have been investigated are both genuinely political (i.e. policymakers choices) and bureaucratic (i.e. the decisions adopted by board members). Their possible interconnections have also been examined.

In a seminal paper, Chappell et al. (1993) suggested that the **process of appointing** committee members was the primary mechanism that generated partisan implications in

monetary policy. Thereafter, political economy tools based on either spatial voting models or the study of reaction functions were widely applied in the monetary policy field. Spatial voting patterns mostly differentiate between internally and externally appointed members (Hansen and McMahon 2008, Bhattacharjee and Holly 2010, Hansen et al. 2014), and assign significant importance to the stages of committee design and monetary policy conduct. Similar results have been obtained using reaction functions (Harris and Spencer 2009), and showed that Bank of England outsiders reacted differently to forecasts of inflation and output than insiders. These results were reinforced by findings that insiders were more likely to vote as a block, choose higher interest rates and be on the winning side of policy decisions. In another perspective, dissents in monetary policy committees can be useful to forecast future individual decisions and policy decisions as well.

At the same time, given individuals' characteristics, Patra and Samantaraya (2007) created an index of monetary policy committee (MPC) **empowerment**. This index summarized ten attributes: separate entity, decision-making role, legal mandate, absence of government override, presence of external members, absence of part-time members, attribution of individual votes to specific members, absence of government voting members, decision by voting (rather than by consensus) and publication of minutes. Higher empowerment is associated with better inflation results.

4. How Central Bankers became Humans: Central Bankers' Preferences and Psychology

One relevant outcome of the general evolution of monetary policy analyses based on the intertwined roles of committee design and central banker preferences has been discussions of **interest-rate inertia**. In these discussions, a view emerged of central bankers as "Econs", a term coined by Alex Leijonhufvud (1973). Thereafter, they became humans – beings that could be affected by psychological biases.

Originally, monetary inertia was motivated by the observation that central bank decisions depend on **information** on the state of the economy as well as by the recognition of the long and variable lags in the transmission of monetary policies. In this framework, agent expectations are assumed to be rational (Muth 1961). Therefore, monetary inertia can be viewed as a rational strategy aimed at avoiding tough stop-and-go policies and their consequences in the form of negative macroeconomic spillovers. The tendency of central banks

to gradually adjust interest rates in response to changes in economic conditions can thus be considered optimal (Woodford 1999, Driffill and Rotondi 2007, Consolo and Favero 2009); moreover monetary policy inertia has been econometrically tested (Moreira and Monte 2020).

Subsequently, under a completely different perspective, monetary policy inertia was analysed by exploring the role of **central bank governance**. In this respect, two studies focusing on monetary policy committees (MPCs) seem particularly interesting: Dal Bo (2006), and Riboni and Ruge-Murcia (2010). Dal Bo (2006) shows that when the voting procedure requires a supermajority (i.e. “consensus setting”), the MPC behaves as a conservative central banker (la Rogoff 1985). The supermajority rule mitigates issues of time inconsistency and introduces a status-quo bias in monetary policy decisions. Adopting this approach, Riboni and Ruge-Murcia (2010) analysed four frameworks of central banking governance: the simple majority (median-voter) regime, the consensus regime, the agenda-setting regime (in which the chairperson controls the board’s agenda), and the dictator regime (characterized by an influential chairperson).

While the simple majority and dictator regimes are observationally equivalent to the original one-central-banker setting, the consensus and agenda-setting regimes are different, as they create something like a persistent status-quo monetary policy. In fact, in the first two regimes, the MPC adjusts the interest rate, taking into account the value preferred by the key members (i.e. the median voter and the chairperson) regardless of the initial status quo. In the other two regimes, the MPC can keep the interest rate unchanged in the “inaction region”. In other words, monetary inertia can occur. Furthermore, the agenda-setting regime experiences larger interest rate increases than the consensus regime when the chairperson is more hawkish than the median member. As such, inertia in interest-rate decisions can be associated with well-defined features of central bank governance.

What happens if we assume that psychological drivers can influence central bankers’ decisions? In general, **behavioural insights** can be used to explain how non-standard agents’ choices can shape macroeconomic performance with reference to, for instance, long-standing debates on consumption, intertemporal substitution, the role of prices and wage stickiness. More specifically, behavioural economics can be used to explain the monetary policy mechanism (Molnar and Santoro 2014) by applying insights from prospect theory. Through the use of adaptive learning, reference-dependent preferences can be linked to loss aversion, such

that losses in consumption utility resonate more than gains. Moreover, bounded rationality can affect monetary policy outcomes (Gabaix 2020)

At the same time, motivational assumptions can be used to explain individual behaviour in politics, which is what **behavioural political economics** (Schnellenbach and Schubert 2015) is all about. In terms of monetary policy economics, the behavioural political economics approach has been used in optimal currency area research to analyse a currency union in which expectations were formed through behavioural-reinforcement learning (Bertasiute et al. 2018).

In relation to monetary policy inertia, behavioural economics has been introduced to explain MPC decisions (Favaretto and Masciandaro 2016¹⁴). Given a standard macroeconomic model with nominal price rigidities and rational expectations, an MPC makes decisions on interest rates using a majority rule. This is where behavioural biases step in, assuming that **loss aversion** can characterize the behaviour of central bankers. When loss aversion affects a central banker, losses loom larger than gains for every monetary policy choice, and both are evaluated with respect to the current interest rate.

The introduction of loss aversion produces “**pigeons**” – central bankers who like the status quo. Then, given the three possible types of central bankers (doves, pigeons and hawks), the more loss aversion characterizes individual behaviour, the more likely monetary inertia will be. This inertia can occur through at least three different channels. First, a *moderation effect* emerges in which the absolute number of pigeons increases. Second, a *hysteresis effect* can arise in which both doves and hawks soften their stances and become more similar to the pigeons. Finally, under a *smoothing effect*, only large macroeconomic shocks can trigger changes in monetary policy. In this way, psychology can become a new driver of monetary inertia independent from the existence of information frictions or the design of MPCs. Notably, loss aversion is just one source of behavioural biases. As discussed by Orphanides (2015), the cognitive psychology perspective can be usefully employed to understand the intertemporal challenges embedded in any monetary policy analysis.

Moreover, this classification can be useful for analysing a fourth central bank type: the **swingers** (Bordo and Istrefi 2018). An empirical investigation (Istrefi 2017) identified those central bankers who switched type over their tenure as swingers. In this framework, the

¹⁴ “How the relationships between institutional setting, central bank preferences and monetary policy outcomes can be modified if we assume that psychological drivers can influence the decisions of the central bankers?” p.51.

importance of swingers depends on the extent to which a change in individual preferences is relevant. In fact, swingers emerge when a relevant change in the distribution of conservatism occurs. For example, the empirical results on the Fed (Malmendier et al. 2020, Bordo and Istrefi 2018) show swings during the early to mid-1970s and from the 1990s to the mid-2000s. This supports the assumption that times of economic hardship can shape central bankers' preferences. Life experience, a psychological factor, is likely to matter (Istrefi 2017). In the same view it is possible to identify a **cautiousness bias** that turns the central banker's psychological concern over uncertainty against her own goal of inflation expectation stabilization (Dupraz et al. 2020). In the same perspective it can be interpreted the fact that in uncertainty times the dispersion in central banker views does not increase, and there is no significant increase in voting dissent rates (Firrell and Reinold 2020).

5. Conclusion

The role of central bank governance in shaping monetary policy decisions appears to be two sides of the same coin. The literature describes the modern central banker as a player with conservative preferences whose incentives depend on a setting that guarantees her or his status as an independent monetary policy agent. However, given the overall independence rules, specific decisions regarding interest rates and monetary policy aggregates will depend on the governance procedures that regulate the activities of the more granular decisions bodies (i.e. the monetary policy committees).

Consensus on the relevance of central bank governance has been achieved in recent years. The governance of central banks has become a benchmark for evaluating the effectiveness of monetary institutions, supported by empirical analyses that stress the association between central bank independence and macroeconomic performance. Nevertheless, a consensus does not constitute complete agreement. At the same time, critical views can stimulate further advances in the research.

Moreover, the literature recognizes that central bankers are individuals who are subject to the same sources of behavioural biases that all individuals face. In the presence of a behavioural bias, the outcome of considering different information sets or different governance rules can be differ significantly from the outcome of the standard analysis. In other words, central bankers can justify their actions using informational reasons (i.e. "we adopted a data-

dependent strategy”) or governance drivers (i.e. “we need to reach a greater consensus”). However, as they are both bureaucrats (i.e. career-concerned players) and humans, other elements can be at play. In particular, central bankers can act based on behavioural biases.

This perspective deserves attention given the fact that the analysis of central bank design must take into account the potential relevance of behavioural biases. Future research must devote additional effort to uncovering the relationship between behavioural biases and alternative settings of monetary policy bodies.

6. References

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7. Appendix: Monetary Policy Economics and Central Bank Governance – A Model

The relevance of the two sides of central bank governance – central bankers' preferences and the central bank's design – can be discussed in a systematic way using a macroeconomic model that develops and simplifies a New Keynesian model of monetary policy (Favaretto and Masciandaro 2016).

7.1 The Economy

We assume that: 1) output growth is determined by a simplified supply curve with nominal and wage rigidities, where $\sigma > 0$ represents the sacrifice ratio when the aim of monetary policy is to influence output growth, which can also be a proxy of the trade-off between flexibility and credibility in monetary policy; and 2) aggregate demand depends on monetary policy via the expectations channel without frictions and lags.

Monetary policy decisions are made that target inflation, which is a goal-based rule. The same decisions can be described using interest-rate rules, which are instrument rules in line with Taylor, or money rules in line with McCallum. The two specifications – goal-based rules and instrument rules – can be used alternatively without any loss of generality provided that the inflation-expectations channel works through changes in the real interest rate. In other words, the model used for business-cycle analysis consists of three equations: the aggregate supply curve, the aggregate demand curve and a monetary policy rule. Therefore, the descriptions of the aggregate supply and aggregate demand curves are as follows:

$$y = \sigma(\pi - \pi^e), \quad (1)$$

$$\text{and } y = \pi^e. \quad (2)$$

We consider an economy with perfect information in which citizens and policy makers interact, and the focus is on defining monetary policy actions to address the business cycle given the institutional setting.

7.2 Central Bank Independence and Monetary Policy

The relevant actors are the central bank and society (i.e. individual agents: households and firms). Each of these actors has goal functions that interact, which gives rise to a Nash equilibrium. The central bank knows the pros and cons of inflation as well the features of the institutional setting (i.e. the monetary regime). In addition, monetary policy is the only game in town. Then the central bank's standard goal function, which is the social goal function, can be expressed as:

$$V_{CB}(\pi) = (\pi - \pi^e) - \frac{1}{2}\sigma\Omega_L\pi^2. \quad (3)$$

In order to obtain the optimal non-negative inflation rate, we assume that the central bank's goal function is such that: 1) the benefits of inflation surprises in terms of output growth are positive, 2) the costs of inflation are positive and 3) the monetary regime matters. With regard to the latter, a focus on a monetary-stability goal - the degree of central bank independence (CBI) or the monetary dominance level – implies higher levels of the parameter Ω .

We now turn to the economy. For each individual agent, aggregate output growth and inflation are givens. The best steps these agents can take are to be rational, to accurately forecast inflation and to try to overcome the time-inconsistency problems. Therefore, they maximize the following goal function:

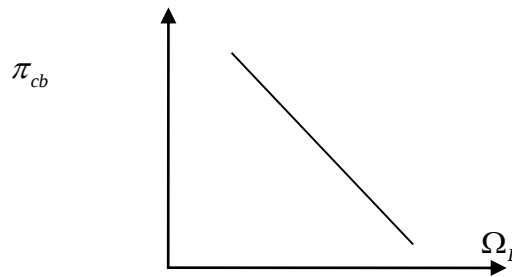
$$V_{ec}(\pi^e) = -(\pi - \pi^e)^2. \quad (4)$$

If the central bank chooses the inflation rate at the same time that individuals decide on their inflation expectations, then the corresponding equilibrium is such that:

$$\pi = \pi^e = \frac{1}{\sigma\Omega_L}. \quad (5)$$

Therefore, in a rational-expectations setting and given the features of the economy summarized in σ , the inflation rate is associated with the type of monetary regime. In other words, higher CBI means lower inflation (Figure 1).

FIGURE 1: INFLATION AND CENTRAL BANK INDEPENDENCE



The inverse association between optimal inflation and CBI dominance shows why, in a rational-expectations world, society finds it in its own interest to delegate monetary policy to a specialized bureaucracy in the form of a central bank. The monetary-dominance regime that we discuss here is an institutional setting in which the monetary policy maker is the central bank, which is independent from the government.

In this way, the importance of the monetary regime in shaping the effectiveness of monetary policy increases. As an institutional feature, CBI can be evaluated using metrics that assess the legal framework in which the central bank operates. At the same time, those metrics can be used to determine whether CBI is associated with macroeconomic performance. In addition, a difference between legal and factual CBI has been acknowledged. Actual practices can differ from formal procedures, especially (but not exclusively) in emerging and transition countries.

Finally, other types of monetary-dominance regimes are possible. Consider, for example, fixed exchange rate architectures that include currency board arrangements in which society establishes an international setting that ties national hands, such that the role of monetary policy as a stabilization tool evaporates. This is another institutional mechanism that can be implemented to increase the policy's credibility.

7. 3 Central Banker Conservatism and Monetary Policy

The extant literature took another step by focusing on the personal characteristics of the individual bureaucrat in charge (i.e. the central banker). The key assumption is that the central banker must be conservative, where central bank conservatism (CBC) refers to the importance that the central banker assigns to the monetary stability goal. Initially, CBI and CBC were generally modelled using a proxy that represented the importance of monetary stability in the policy maker's goal function – our parameter Ω . Over the years, however, researchers have acknowledged that CBI and CBC are different concepts. Independence is an institutional feature of the monetary regime, while conservatism is a personal attitude of the central banker.

Conservatism is a key characteristic of the central banker as a bureaucrat, as delegating monetary policy to a player who is inflation averse represents an additional commitment to increasing the monetary policy's credibility and its effectiveness in terms of inflation performance. In the literature, CBI and CBC are two distinct and relevant elements in central bank governance that are focused on effective monetary policy. In general, CBI and CBC are viewed as substitutes.

With the aim of highlighting the associations among CBI, CBC and inflation, let $V_{cb}(t_{cb}, \pi)$ be the central banker's utility function:

$$V_{cb}(t_{cb}, \pi) = B(t_{cb}, \pi) - C(t_{cb}, \pi) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2} \sigma \Omega_L t_{cb} \pi^2, \quad (6)$$

where $B(t_{cb}, \pi)$ and $C(t_{cb}, \pi)$ are the individual benefits and costs, respectively; Ω_L is the CBI level; and $t_{cb} > 0$ is the degree of CBC. The central bankers take the pros and cons of any inflation policy into account. We assume that the individual benefits are increasing and concave in the inflation rate:

$$\frac{\partial B(t_{cb}, \pi)}{\partial \pi} = \frac{1}{\sqrt{\pi} t_{cb}} > 0; \quad \frac{\partial B^2(t_{cb}, \pi)}{\partial \pi} = -\frac{1}{2\pi^{3/2} t_{cb}} < 0, \quad (7)$$

Notably, we already know that inflation can be a beneficial tool for macroeconomic stabilization from the central bank's point of view. Now, individual central bankers are bureaucrats who can consider inflation (i.e. seignorage) as a financial resource for their organisations. Moreover, central bankers assume rational expectations. In other words, they do not try to exploit inflation surprises.

In fact, given a basic central bank balance-sheet constraint, we know that when d is the real dividend that the central bank pays to the state, h is the flow of currency and θ is the nominal cost of running the central bank, the central bank's income increases with inflation:

$$d + \pi = h + \theta.$$

We also assume that individual costs are increasing and convex in the inflation rate given that central bankers care about their personal reputations:

$$\frac{\partial C(t_{cb}, \pi)}{\partial \pi} = \sigma \Omega_L t_{cb} \pi > 0; \quad \frac{\partial C^2(t_{cb}, \pi)}{\partial \pi} = \sigma \Omega_L t_{cb} > 0. \quad (7)$$

Finally, we assume that central bankers can be heterogeneous with respect to their degree of conservatism, which is common knowledge. Then they can be indexed, such that

more conservative central bankers bear higher marginal costs and/or enjoy lower marginal benefits from any given monetary policy given that the implementation of an inflationary policy is costly for a conservative central banker:

$$\frac{\partial B(t_{cb}, \pi)}{\partial \pi} = -\frac{2\sqrt{\pi}}{t_{cb}^2} < 0; \quad \frac{\partial C(t_{cb}, \pi)}{\partial \pi} = \frac{\sigma\Omega_L\pi^2}{2} > 0. \quad (8)$$

The central banker's preferred inflation rate, π_{cb} , is such that the marginal benefits match the marginal costs:

$$\frac{\partial B(t_{cb}, \pi)}{\partial \pi} = \frac{\partial C(t_{cb}, \pi)}{\partial \pi}; \quad \frac{1}{\sqrt{\pi}t_{cb}} = \sigma\Omega_L t_{cb} \pi. \quad (9)$$

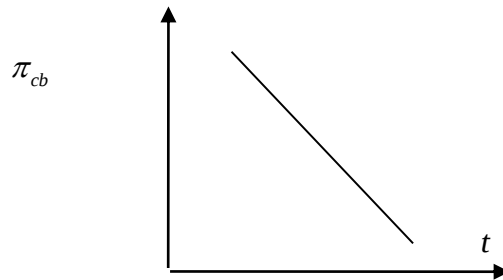
Then:

$$\pi_{cb} = \frac{1}{t_{cb}^{4/3} \sigma^{2/3} \Omega_L^{2/3}}. \quad (10)$$

Inflation and CBC are inversely associated. The same is true for inflation and CBI, as a lower risk of monetary policy capture implies lower inflation. At the same time, a more efficient economy (i.e. a lower sacrifice ratio, which also means a more convenient trade-off between flexibility and credibility) means lower inflation. As in the case of CBI, researchers have developed indices of CBS in which the most accurate analyses discuss or use separate indicators for independence and conservatism.

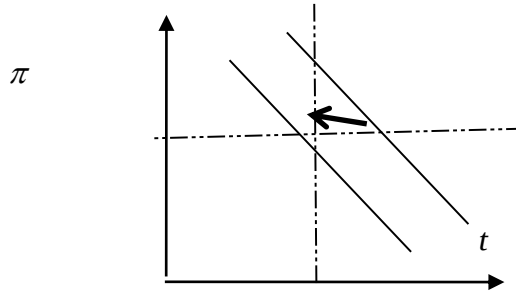
Graphically, the inflation rate is inversely correlated with the degree of CBC (Figure 2).

FIGURE 2: INFLATION AND CENTRAL BANK CONSERVATISM



CBI and CBC are substitutes – any change in CBI will modify the corresponding inflation rate given the degree of CBC. For instance, a regime reform that increases CBI will reduce the preferred inflation rate for any level of conservatism. This implies that, given the institutional reform, the same level of inflation is associated with a lower level of conservatism (Figure 3).

FIGURE 3: INFLATION AND CENTRAL BANK INDEPENDENCE



This result fits with the well-known finding that it is optimal to hire a central banker who is more conservative than the average citizen. In a sense, the optimal level of conservatism becomes a state-contingent variable given the institutional setting, Ω , as well as the structural features, σ , of the economy.

The relevance of the central banker's personal attitude becomes even more evident if we explore its possible determinants. For the sake of simplicity, we normalize both the sacrifice ratio and the degree of CBI to one. Therefore, the central banker's utility function becomes:

$$V_{cb}(t_{cb}, \pi) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2}t_{cb}\pi^2, \quad (11)$$

and the preferred inflation rate is:

$$\pi_{cb} = \frac{1}{t_{cb}^{4/3}}. \quad (12)$$

Notably, conservatism is associated with a certain terminology in which a *hawk* is a policy maker who dislikes inflation and fights it by tightening monetary policy (i.e. conservatism is high), while a *dove* is a policy maker who is more tolerant of inflation, favours a lax monetary policy and pursues other policy objectives, such as low unemployment (i.e. conservatism is low). Given equation (12), this differentiation between doves and hawks has become one of the main focal areas in analyses of the relationship between monetary policy decisions and macroeconomic performance.

In fact, the extant research takes one more step when considering the degree of conservatism as an endogenous variable (i.e. when investigating the determinants of central bankers' monetary preferences). Central bankers' conservatism can depend on regional biases; gender; education, occupational background and political preferences; personal experiences; or a combination of these factors. All else equal, any change in a relevant driver can trigger a change in the central bankers' conservatism and, consequently, in the preferred inflation rate.

For example, if we assume that gender is the only individual-level feature that matters in shaping monetary preferences and that female central bankers generally adopt a more hawkish approach to monetary policy, then the optimal inflation rate will be lower when a female central banker is in charge: $\pi_{cb} = \frac{1}{t(\gamma)^{4/3}}$, where γ represents the central banker's gender.

7. 4 Central Bank Committees and Monetary Policy

What are the consequences when monetary policy is made by committees rather than a single central banker? The monetary policy outcome becomes the endogenous result of the interactions between the central bank's practices, with particular attention paid to voting protocols, and the preferences of the central bank's board members. These two features can be discussed separately.

Starting with the voting protocols and given the board members' preferences, we assume that a monetary policy committee (MPC) with N members formulates monetary policy decisions. The central bankers who are members of the MPC are individuals (i.e. voters) who are heterogeneous in terms of their conservatism (i.e. the value of the parameter t_j , where j represents the specific central banker). We assume that:

- a) Each MPC member maximizes his or her own goal function, $V_j(t_j, \pi)$:

$$V_j(t_j, \pi) = \frac{2\pi^{0.5}}{t_j} - \frac{1}{2}t_j\pi^2, \quad (13)$$

- b) Each MPC member chooses his or her preferred inflation rate, π_j , and

- c) The social planner solution is independent from the voting procedures.

The social planner will nominate the N board members, taking heterogeneity in individual preferences into account. The optimal monetary policy will be obtained by optimizing the sum of the preferences of the individual central bankers:

$$\sum \frac{2\pi^{0.5}}{t_j} - \frac{1}{2}t_j\pi^2. \quad (14)$$

where the average inflation, π_a , is the policy that equalizes the average marginal benefits, $B_a(t_a, \pi)$, with the average marginal costs $C_a(t_a, \pi)$, where t_a is the average conservatism:

$$\frac{1}{\sqrt{\pi t_a}} = t_a \pi. \quad (15)$$

This is where the importance of voting protocols enters the picture. For example, let us assume that the board votes using a majority rule. The monetary policy outcome is therefore the median type's preferred inflation rate, π_m . The inflation rate in equilibrium will be inversely correlated with the conservatism, t_m , of the median central banker:

$$\pi_m = \frac{1}{t_m^{4/3}}. \quad (16)$$

Notably, the median type's policies do not necessarily coincide with the average preferences of the central bankers. Therefore, it will generally be true that:

$$\text{If } t_m \neq t_a \text{ then } \pi_m \neq \pi_a. \quad (17)$$

In other words, as the conservatism of the median central banker is not necessarily equal to the average preferences of the board members, the corresponding monetary decisions are likely to differ. Consequently, when monetary committees enter the picture, voting protocols matter

given that how the preferences are aggregated determines the actual monetary policy outcome.

Given the above-mentioned discussion on whether and how conservatism and its drivers matter, it is worth noting that one highly disputed issue is the factors that affect the board's overall preferences. In general, board diversity can trigger more effective monetary policy choices, thereby increasing their regularity. As a result, the evaluation of monetary policy on the basis of board composition has mostly become a political economy issue. The application of new tools, such as spatial voting models and studies of individual reaction functions, is now widespread.

Furthermore, given the voting protocol, the final monetary policy outcome will depend on the drivers that shape the board's preferences. For example, if we assume that board diversity is the only collective feature that shapes monetary preferences and that the voting protocol is still majority rule, then the corresponding inflation rate will be:

$$\pi_m = \frac{1}{t_m(\delta)^{4/3}}, \quad (18)$$

where δ represents the board's diversity.

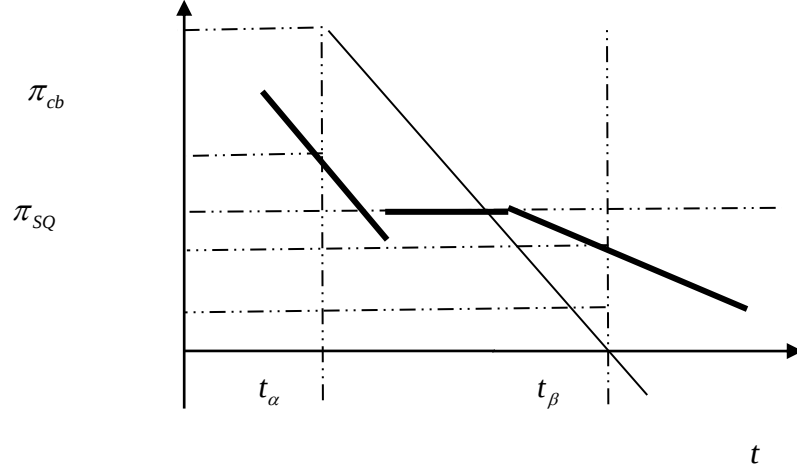
7. 5 When Central Bankers become Humans: Behavioural Monetary Policymaking

In general, analyses of central bankers' behaviour are based on the assumption that they are standard rational decision makers. Here we explore a different perspective, which assumes the presence of loss aversion, such that the central bankers who are making decisions within a monetary policy committee perceive any outcome in terms of expected gains and losses relative to a reference point. This represents their endowment and coincides with the "status quo" (i.e. the actual inflation rate).

We assume that when loss aversion affects central bankers' behaviour, costs loom larger than benefits for every monetary policy choice and that both are evaluated with respect to the status-quo inflation. Let π_{SQ} be the status-quo inflation and $z > 0$ be the parameter that captures loss aversion. With loss aversion, the central banker becomes particularly prudent from two symmetrical points of view. On the one hand, the loss-averse central banker dislikes the upside risks – an increase in inflation, such that $\pi > \pi_{SQ}$, normally entails more benefits than costs. However, with loss aversion, higher inflation costs yield psychological losses that amount to:

$$z \left[C(t_{cb}, \pi) - C(t_{cb}, \pi_{SQ}) \right] = z \frac{1}{2} t_{cb} (\pi^2 - t_{SQ}^2). \quad (19)$$

FIGURE 4: MONETARY CONSERVATISM WITH LOSS AVERSION



In other words, with loss aversion, the central banker becomes relatively more hawkish when $\pi > \pi_{sq}$, given that the loss-averse central banker overestimates inflation costs. See, for example, the central banker with conservatism, t_α , in Figure 4.

On the other hand, the loss-averse central banker would like to avoid the downside risks. Reducing the inflation rate, such that $\pi < \pi_{sq}$, entails fewer benefits than costs overall, with psychological losses in terms of benefits amounting to:

$$z \left[B(t_{cb}, \pi_{sq}) - B(t_{cb}, \pi) \right] = z \frac{2\pi^{0.5}}{t_{cb}} (\pi_{sq}^{0.5} - t\pi^{0.5}). \quad (20)$$

With loss aversion, when $\pi < \pi_{sq}$, each central banker becomes relatively more dovish, given that the loss-averse central banker underestimates the benefits of monetary stability. In Figure 4, see the central banker with conservatism, t_β .

Therefore, the central banker's goal function with loss aversion (i.e. the reaction function of the prudent central banker) is given by the standard utility $V_{cb}(t_{cb}, \pi)$ minus the psychological losses due to the departure from the status quo:

$$V_{cb}(t_{cb}, \pi / \pi_{sq}) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2} t_{cb} \pi^2 - \frac{1}{2} z t_{cb} (\pi^2 - t\pi_s^2) \text{ if } \pi > \pi_s, \quad (21)$$

and

$$V_{cb}(t_{cb}, \pi / \pi_{sq}) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2} t_{cb} \pi^2 - z \frac{2\pi^{0.5}}{t_{cb}} (\pi_{sq}^{0.5} - t\pi^{0.5}) \text{ if } \pi < \pi_s. \quad (22)$$

For the prudent central banker, the marginal optimal conditions and the corresponding preferred inflation rates, $\pi_H < \pi_{sq} < \pi_D$, are as follows:

$$\frac{1}{\pi^{0.5} t_{cb}} = (1+z) t_{cb} \pi \text{ and } \pi_H = \frac{1}{t^{4/3} (z+1)^{2/3}} \text{ if } \pi > \pi_{sq}, \quad (23)$$

$$\frac{1}{\pi^{0.5} t_{cb}} = t_{cb} \pi \quad \text{and} \quad \pi_{SQ} = \frac{1}{t^{4/3}} \quad \text{if } \pi = \pi_{SQ} \text{ and} \quad (24)$$

$$(1+z) \frac{1}{\pi^{0.5} t_{cb}} = t_{cb} \pi \quad \text{and} \quad \pi_D = \frac{(z+1)^{2/3}}{t^{4/3}} \quad \text{if } \pi < \pi_{SQ} \quad (25)$$

Given the status-quo inflation, the conservatism of the prudent central banker will remain in a corridor where the lower and the upper limits represent the doves and hawks, respectively. Discounting the aversion to the inflation risks in equilibrium, the prudent dovish central banker will be characterized by a level of conservatism, t_D , such that:

$$\frac{\partial B(t_D, \pi)}{\partial \pi} = (1+z) \frac{\partial C(t_D, \pi)}{\partial \pi}, \text{ i.e.: } \frac{1}{\pi^{0.5} t_D} = (1+z) t_D \pi, \quad (26)$$

where:

$$t_D = \frac{1}{\pi^{0.5} \sqrt{\pi^{1/2} z + \pi^{1/2}}}. \quad (27)$$

At the opposite end of the corridor, avoiding the risks of any monetary stability obsession – condition (38) – the prudent hawkish central banker will be characterized in equilibrium by a level of conservatism, t_H , such that:

$$(1+z) \frac{\partial B(t_H, \pi)}{\partial \pi} = \frac{\partial C(t_H, \pi)}{\partial \pi}; \text{ i.e.: } \frac{(1+z)}{\pi^{0.5} t_H} = t_H \pi, \quad (28)$$

where:

$$t_H = \frac{\sqrt{\frac{z}{\pi^{1/2}} + \frac{1}{\pi^{1/2}}}}{\pi^{1/2}}. \quad (29)$$

As $t^D < t^H$, the dovish attitude and the hawkish attitude represent the bounds of the corridor of central bank prudence. Therefore each central banker, j , will set his or her preferred inflation rate, π_j , given his or her level of conservatism, t_j , according to the following rule:

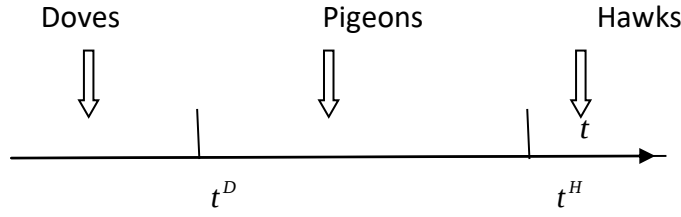
$$\pi_D = \frac{(z+1)^{2/3}}{t^{4/3}} \quad \text{if } t_j < t_D, \quad (30)$$

$$\frac{1}{\pi^{0.5} t_{cb}} = t_{cb} \pi \quad \text{if } t_D < t_j < t_H \text{ and} \quad (31)$$

$$\pi_H = \frac{1}{t^{4/3} (z+1)^{2/3}} \quad \text{if } t_j > t_H. \quad (32)$$

The introduction of loss aversion produces a novel result regarding the diversity of a monetary committee. Now every central bank board can be divided into in three groups: doves ($\text{if } t_i^d < t$), hawks ($\text{if } t_i^h > t$) and pigeons ($\text{if } t_i^d < t < t_i^h$) (Figure 5).

FIGURE 5: CENTRAL BANKER TYPES: DOVES, PIGEONS AND HAWKS

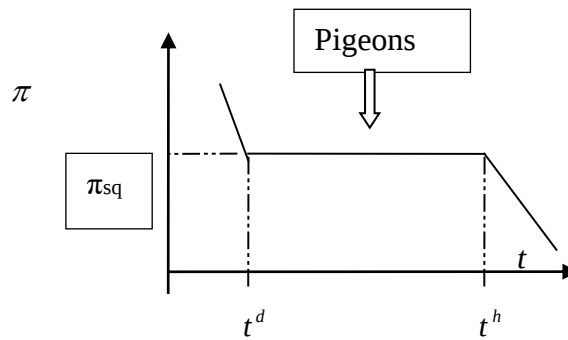


Each board member expresses well-defined inflation preferences, but now, with respect to a situation without psychological distortion, i) each central banker evaluates any policy in terms of changes from the monetary policy status quo and ii) any negative effect of a change with respect to the status quo will loom larger than a positive effect of equal magnitude. However, if prudence produces a loss/gain asymmetry for central bankers, then monetary policy decisions will change.

We already know that the MPC chooses the monetary policy strategy using a majority rule and that the outcome is the median type's inflation rate, π_m . Therefore, the preferred inflation rate will depend on median conservatism, t_m , which has three possibilities: dove, pigeon and hawk. More precisely, three different equilibria can arise (Figure 6):

$$\pi > \pi^s \text{ if } t_m < t^D, \pi = \pi^{SQ} \text{ if } t^D < t_m < t^H, \pi < \pi^{SQ} \text{ if } t_m > t^H. \quad (33)$$

FIGURE 6: MONETARY POLICY AND CENTRAL BANKER TYPES



The existence of loss aversion can influence monetary decisions through the *inertia effect*. The policy outcome will be the status-quo inflation, π^s , if the median voter is a pigeon.

Furthermore, given that the distance between t^d and t^h is increasing in $z > 0$, the more loss aversion is increasing, the more likely the median voter is to be a pigeon. In other words, a status-quo bias in monetary strategy (i.e. monetary inertia) will emerge. As such, more loss aversion among MPC members reduces the distance among their monetary policy positions. The doves overestimate the inflation costs, which limits their dovishness. The hawks overestimate the reduction in macro stabilization as well as seignorage losses, which dampens their hawkishness. As the central bankers become more loss averse, pigeons increase in

number and monetary inertia is likely to arise and/or to persist. Therefore, in classifying different preferences, the traditional labels of hawks and doves can be enriched with pigeons, where a pigeon is a central bank member who avoids deciding between assigning high importance to monetary stability or supporting the use of monetary policy for other macroeconomic purposes.

Finally, this classification can be useful for analysing a fourth type of central banker: swingers. Swingers are central bankers who switch types during their tenure. In our framework, the importance of swingers depends on the extent to which the change in individual preferences is relevant. In fact, swingers emerge when a change in the distribution of conservatism occurs. Let us call θ the shock in preferences. This shock produces swingers as well as a change in the prudence corridor, where t_n^D, t_n^H are the new lower and upper bounds, respectively, while t_{nm} is the conservatism of the new median central banker. If the shock is relatively small, the median central banker will remain in the corridor, the monetary policy decisions will be the same and the presence of swingers will be irrelevant. The swingers matter when the shock, θ , is relatively large (i.e. when either $\theta > t_n^H - t_{nm} \geq 0$ or $\theta < t_n^D - t_{nm} \leq 0$). This result can be useful for interpreting evidence on swingers. For example, empirical results on the FED show relevant swings during the early to mid-1970s and from the 1990s to the mid-2000s. These results support the assumption that times of economic hardship (i.e. a big θ in our framework) can shape central bankers' preferences. Life experience, which is another psychological factor, is likely to matter.