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CENTRAL BANKING AND MONETARY POLICY IN  
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**WHAT BIRD IS THAT?**  
**CENTRAL BANKING AND MONETARY POLICY IN THE LAST FORTY YEARS**

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Donato Masciandaro<sup>♦</sup>

The aim of this paper is to review the historical development of monetary policy theory since the 1980s using as focal point the nexus among central bank governance, central banker preferences and monetary policy effectiveness. Assuming a positive perspective the review highlights three subsequent but overlapping stages: modern economics, advanced political economy and behavioural economics. First, the central bank emerged as an independent institution. Second, conservative central bankers were viewed as bureaucrats who used committees to make monetary policy decisions, where the differentiation between hawks and doves gained momentum. Third, more recent research focused on the fact that psychology can matter for explaining how central bankers reach their decisions. The traditional distinction has been enriched with pigeons and swingers.

Keywords: Monetary Policy, Central Banking, Political Economics, Behavioral Economics, Central Bank Independence, Conservatism, Monetary Policy Committee, Hawks and Doves

JEL Classification: E03, E52, E58

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## 1. Introduction

This paper sheds light on the following question: It is possible to consider the development of monetary policy theory over the last forty years as an evolutionary path? The answer is “yes” under two conditions. First, the analysis must be based on the relevance of two pillars: central bank governance and central bankers’ preferences. Second, three methodological tools - modern economics, advanced political economy and behavioral economics - must be applied in a synergic way.

The paper explores the question on how central bank design and central banker characteristics interact in determining monetary policy choices and critically assesses the specific contributions of the three research perspectives. Romer and Romer (1997), Cukierman (2004), Alesina and Stella (2010), **Parkin (2012)**, Reis (2013) and de Haan and Eiffinger (2016) are fundamental precursors. However, none of these papers: i) focus on the nexus between central bank governance and central banker preferences as the main key to reading the extant literature, ii) use a formal model throughout the overall discussion, and iii) show how three theoretical perspectives can serve as subsequent but complementary and overlapping tools. Moreover this paper sheds light on the possibilities of applying the behavioral political economics perspective (Schnellenbach and Schubert 2015) to the monetary policy field.

In every step of this discussion, the focus is on highlighting the interconnections between the topic (i.e. the nexus between governance and preferences) and available tools (i.e. different but overlapping approaches). An effort has been made to link relevant assumptions and conclusions with the corresponding historical development in the literature.

Originally, optimal monetary policy choices were explained using modern economics. The economic rationale is well known and the theoretical bottom line can be summarized as follows: for various reasons, policy makers tend to adopt a short-term perspective when using monetary tools. They use these tools to smooth out various kinds of macroeconomic shocks and to exploit the trade-offs between real gains and nominal costs. However, the more markets are efficient and rational, the greater the risk that short-sighted monetary policy will generate negative macroeconomic distortions. Therefore, banning the use of monetary policy for myopic purposes becomes the social goal and the institutional setting gains momentum.

Thereafter, a political economy perspective in which central banks were viewed as delegated agents was explored. In this perspective, the role of central bank governance was assumed to be of crucial importance. Initially, the central bank setting was interpreted as a two-sided coin. On the one side, the central bank must be independent. Society expects lawmakers to define a long-run monetary setting, which then establishes the perimeter within which the central bank is allowed to use short-run activities to implement non-inflationary monetary policy without short-sighted political interference.

On the other side, the central banker must be conservative, where “conservatism” refers to the relative importance that the central banker assigns to monetary stability in relation to other macroeconomic objectives. Given the institutional setting, this characteristic is necessary for ensuring that the central banker does not become a source of inflation bias when addressing business-cycle shocks. As such, independence and conservatism become the conditions for implementing credible, and, consequently effective monetary policies.

Initially, independence and conservatism were generally modelled by a unique proxy that represented the importance of monetary stability in policy makers' goal function. However, it has since been widely acknowledged that independence and conservatism are different concepts - independence is an institutional feature of the monetary regime, while conservatism is a personal attitude of the central banker.

Consequently, a second step in the literature can be identified. Economic analyses began to focus on the personal characteristics of individual bureaucrats (i.e. the central bankers). Conservatism is a key personal feature of the central banker as bureaucrat, given that delegating monetary policy to a player who is inflation averse represents a commitment to increasing the monetary policy's credibility and its effectiveness in terms of macroeconomic performance. Therefore, independence and conservatism (i.e. rules and preferences, respectively), became two distinct and relevant aspects in relation to the effectiveness of monetary policy.

In parallel, the importance of another feature of central bank governance was recognized – the fact that monetary policies are designed and implemented by committees. This feature of central bank governance can influence monetary policy decisions. What are the consequences when monetary policy is made by committees instead of a single central banker?

Until recently, cognitive biases have not been assumed to affect central bankers. How might the relationships among the institutional setting, central-banker preferences and monetary policy outcomes be modified if we assume that psychological drivers can influence central bankers' decisions?

All in all, a key of reading based on the nexus governance – preferences can be useful in interpreting what's is going on in a moment when the economic and political importance of central banks in the advanced economies has grown since the beginning of the 2007-2008 crisis<sup>1</sup>. Supervisory and regulatory responsibilities have been piled onto the central banks, thereby intensifying the relationships among banking, fiscal and monetary policies<sup>2</sup>. The boundaries between the central bank's role as liquidity manager and the government's solvency support for banking and financial institutions have been blurred, inevitably triggering a debate on the shape of central bank regimes<sup>3</sup>, especially with regard to the CBI features<sup>4</sup>. These aspects have also been in focus from a historical perspective<sup>5</sup> and in specific case studies, such as studies of the European Central Bank (ECB)<sup>6</sup> or the Bank of England<sup>7</sup>. In this vein, an important question is whether the policy-blurring effect has made the pendulum swing in the other direction. Thus far, comparative analyses have not offered homogenous results<sup>8</sup>. At the same time

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<sup>1</sup> Buiter (2014), Ueda and Valencia (2014), Draghi (2018).

<sup>2</sup> Bayoumi et al. (2014), de Haan and Eijffinger (2017), Barthelémy and Plantin (2018), Barthelémy et al. (2019), Gavin (2018).

<sup>3</sup> Nier (2009), Cecchetti et al. (2011).

<sup>4</sup> Cukierman (2008) and (2013), Cecchetti (2013), Taylor (2013), Buiter (2014), Sims (2016), Blinder (2017).

<sup>5</sup> Bordo and Siklos (2017), Ugolini (2017).

<sup>6</sup> Wyplosz (2018), Thiele (2018).

<sup>7</sup> Every (2018).

<sup>8</sup> Bodea and Hicks (2015), de Haan et al. (2018), Masciandaro and Romelli (2018).

however, in this most recent surge in the topic's popularity, some have noted<sup>9</sup> that the critical voices seem to dominate<sup>10</sup>.

The article is organised as follows. The following Sections Two and Three present the model that is used in every step of the discussion and describes its application in explaining the role of central banks as independent monetary policy maker that were incorporated in the modern economics when the political economy perspective began to emerge. In order to show the steps in the political economy approach, the subsequent Sections Four and Five zooms in on the role of individual central bankers, whose decisions are collectively made in monetary policy committees. Thereafter, recent applications of behavioural economics that enrich the monetary comitology perspective are discussed in Sections Six and Seven. Section Eight concludes.

## 2. Long Run: Designing Monetary Institutions

The relevance of central bank governance and central banker preferences can be discussed in a systematic way using a standard New Keynesian model, where output is determined by a Phillips curve and a two tier setting governs the monetary policymaking.

We assume that: 1) the output growth is determined by a simplified supply curve with nominal and wage rigidities<sup>11</sup>, where  $\sigma > 0$  represents the sacrifice ratio when the aim of monetary policy is to influence the output growth, which can also be a proxy of the trade –off between flexibility and credibility in the monetary policy action<sup>12</sup>; and 2) aggregate demand depends crucially on monetary policy via the expectations channel<sup>13</sup> without frictions and lags<sup>14</sup>.

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<sup>15</sup>, or money rules in line with McCallum<sup>16</sup>. 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<sup>17</sup>. In other words the model used for business cycle analysis consists of three equations: aggregate supply and aggregate demand curves, together with a

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<sup>9</sup> Alesina A. and Stella A., (2010), Cecchetti S.G., (2013), Bayoumi T. et al, (2014), Issing O., (2018).

<sup>10</sup> Stiglitz J.E., (2013), Balls E. et al. (2016), Rodrik D. (2018), Rogoff K.S. (2019).

<sup>11</sup> Barro and Gordon (1983), Backus and Driffill (1985); For the sake of simplicity here the natural rate is zero, as in Rogoff (1985).

<sup>12</sup> Rogoff (1985).

<sup>13</sup> Clarida et al. (1999).

<sup>14</sup> Schellekens (2002). On monetary policy uncertainty see the seminal works: Friedman (1968), Poole (1970), Cukierman and Meltzer (1986).

<sup>15</sup> Taylor (1993).

<sup>16</sup> McCallum (1987) and (1993).

<sup>17</sup> Clarida et al. (1999), Tillmann (2012). More generally, the effects of monetary policy actions can be transmitted either through changes of the nominal interest rate or variations in the quantity of money; see McCallum (1997), Ireland (2004), Nelson (2005), Favara and Giordani (2009), Caraiani (2016), Belongia and Ireland (2019) for more detailed discussions.

**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 two different and subsequent events occur: a “constitutional” event a “policy” event. In the first event, society operates with a long run perspective. The lawmakers decide the relevant features of the monetary policy setting. In other words, they design the institutional delegation process in the monetary policy area. In the second event, which is characterized by a short- run horizon, citizens and policy makers interact, and the focus is on defining monetary policy actions to address the business cycle given the institutional setting determined in the previous event.

Given the two tier framework,<sup>18</sup> in the legislative stage – or “constitutional” moment <sup>19</sup> - the lawmakers simultaneously decide on two monetary institutions<sup>20</sup>: how to design the monetary policy task ( i.e. the monetary policy regime) and who has the control over that policy (i.e. the monetary policymaker). We assume that the lawmakers are long sighted players, and that the legislature decides on monetary policy issues through supermajority vote<sup>21</sup> and approves proposals<sup>22</sup> that define the monetary institutions' features. The link between the two events is these monetary institutions, which represent a public good<sup>23</sup>. When designing monetary institutions, the lawmaker is a fully rational player with respect to preferences and consequent choices<sup>24</sup>.

We assume that the legislature works under a veil of full ignorance<sup>25</sup>, such that it completely ignores not only the possible structure of the governments in the future (i.e. in the second event, which is the short run environment) but it also views the fact that some of the incumbent lawmakers may be part of those governments as irrelevant. In other words, during the constitutional event, the legislator does not know whether he or she (hereafter “she”) will be in favour of the monetary regime in the policy event - she

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<sup>18</sup> In the monetary institutions' design the two tier setting – i.e. the distinction between monetary institutions and monetary policies originally introduced in Buchanan (1962) - has been implemented in Romer and Romer (1997); see also: Herrendorf and Lockwood (1997), Drazen (2002), Hughes Hallet and Weymark (2005) and (2007), Hefeker and Zimmer (2011), (Miller 2019). It is worth noting that the distinction between monetary regimes and monetary rules is absent in Friedman (1962). From a law and economics perspective, the lawmaker action in monetary policy design can be interpreted as a case of law for macroeconomic purposes; see: Listokin (2019).

<sup>19</sup> Persson and Tabellini (2004), Aghion et al. (2004), Alesina and Tabellini (2007).

<sup>20</sup> On institutions and policies see: Besley and Case (2003).

<sup>21</sup> On supermajority voting and time inconsistency issue see: Dal Bo (2006). In general on legislatures and policies see: Battaglini and Coate (2007).

<sup>22</sup> The draft of the monetary proposal that the legislature approves can be the final outcome of intermediate – both hard and soft - interactions between politicians and bureaucrats; for the case of the ECB establishment see James (2013).

<sup>23</sup> See: Battaglini and Coate (2007).

<sup>24</sup> The lawmaker description can be enriched along behavioral lines, taking stock from the explicit incorporation of behavioral concepts, as loss aversion; see: Attanasi et al. (2017).

<sup>25</sup> See: Romer and Rosenthal (1983), Aghion and Bolton (2003), Aghion et al. (2004).

just wishes to tie the hands of future governments. Moreover, voting rules and lawmaker preferences are exogenous.

With regard to the monetary policy regime, society knows that politically short-sighted incentives can negatively influence monetary policy decisions<sup>26</sup>. Notably, the rationale for delegating monetary policy to an independent policy maker in the form of a specialized monetary policy player is that the monetary policy player has a long-term perspective, which should minimize the risk of short-sighted policies, including but not limited<sup>27</sup> to the time-inconsistency strategies<sup>28</sup>. **The basic intuition is that two sources of output growth instability can be isolated<sup>29</sup>. The first source of growth instability is the economic variability induced by macroeconomic shocks that monetary policy is supposed to address. The second source is political. By insulating monetary policy from political pressures, a monetary regime can reduce the political variability; the question is whether and how the monetary regime design affect the manner in which monetary policy responds to macroeconomic shocks, smoothing economic variability. The legislature addresses the trade-off between long run benefits and short run costs.**

Therefore society decides that monetary policy design must be institutionally isolated from the possibility of distortionary policies and it assigns constitutional relevance to the monetary stability goal. This means that the institutional setting must minimize the possibility that monetary policy can be captured by other economic policies. This property is known as the “monetary dominance” feature<sup>30</sup>. The monetary dominance characteristic is captured through the parameter  $\Omega > 0$ . The intuition is that the higher  $\Omega$  is, the higher monetary dominance will be. The monetary regime represents a case of an institutional commitment device - the value of  $\Omega$  includes its robustness (i.e., how difficult is to change the law and then use it to modify the degree of monetary dominance<sup>31</sup>).

Let us describe the delegation framework between society and lawmakers<sup>32</sup>. Society cares about the effectiveness of the monetary policy regime according to a classic well-behaved concave function  $U = U(\Omega)$  in which social welfare increases with the optimal level of the monetary dominance. Finding the optimal level of monetary dominance is not a trivial task, given that both social benefits and costs must be weighted. Linear preferences are used:

$$U(\Omega) = \Omega. \quad (3)$$

<sup>26</sup> See: Kydland and Prescott (1977), Barro and Gordon (1983), Rogoff (1985).

<sup>27</sup> See: Eggertsson and Le Borgne (2010), McCallum (1995), Fischer (1995).

<sup>28</sup> On the relationship between monetary policy time-inconsistency and central banking design see: Cukierman (1994), Masciandaro (1995), Eijffinger and de Haan (1996), Berger et al. (2001), Wray (2007), de Haan et al. (2008), Cukierman (2008), Alesina and Stella (2010), Klomp and de Haan (2010a), Cukierman (2013), **Fernandez-Albertos (2015)**, de Haan and Eijffinger (2016).

<sup>29</sup> See: Alesina and Gatti (1995).

<sup>30</sup> See: Sargent and Wallace (1981). In a sense, the monetary dominance regime implies that the fiscal authority can commit to a Ricardian intertemporal budget constraint, i.e. the budget constraint holds for all paths of the price level. **On monetary dominance and the supply of liquidity from both fiscal and monetary authority see Barthelemy et al. (2019).**

<sup>31</sup> See: Alesina and Grilli (1992), Elster (1995), Walsh (2000), **Giordani and Spagnolo (2001)**; for the FED case, see Blinder (2010).

<sup>32</sup> Here we adapt a general delegation framework - see: Alesina and Tabellini (2007) – to describe the lawmaker behavior in designing the monetary policy setting.

The lawmaker's reward is based on how she carries out her job. Our lawmaker is a politician: we assume that the lawmaker wishes to please the citizens. Alternatively, we could also assume that the lawmaker aims to please specific constituencies (e.g. the lobbies). Nevertheless, we adopt the *helping hand view* of the lawmaker's type - she wishes to please citizens rather than a particular constituency or lobby (*grabbing hand view*)<sup>33</sup>. This assumption allows us to show the conditions under which the final monetary policy regime – the actual level of  $\Omega$  – can be different from the social optimal one despite the lawmaker's desire to please the citizens.

The level of  $\Omega$  is determined by the lawmaker's ability,  $\Phi$ , and by her effort,  $a$ :

$$\Omega = a + \phi . \quad (4)$$

In the first constitutional moment, the sequence of events is as follows: a) society chooses to delegate the task of designing the monetary policy regime to the lawmaker; b) the lawmaker chooses her effort,  $a$ , before knowing her ability,  $\Phi$ , with regard to implementing this particular task (building up a monetary policy regime is not a usual task); the lawmaker establishes the regime, thereby revealing her ability,  $\Phi$  and d) citizens observe the regime but not the relationship between effort and ability, as they cannot distinguish innate talent from contingent effort. They then reward the lawmaker.

The lawmaker's utility function, denoted by  $L = L(R, C)$ , is defined as:

$$L = R(U) - C(a) , \quad (5)$$

where  $R(U)$  is the reward function and  $C(a)$  is the cost function. Intuitively, the lawmaker evaluates the decisions on monetary policy institutions against the status quo. The political reward is function of the social utility, while the political costs are function of the effort needed to implement the task. The lawmaker evaluates every task assignment while taking the political rewards and costs of doing so into account. Let us describe the three crucial features of the lawmaker:

i) Ability: The ability of the lawmaker is a random variable with a normal distribution, where we denote by  $\Phi_{AV}$  the mean;

ii) Political reward: The incumbent lawmaker wishes to be re-elected. The lawmaker therefore needs to provide the majority of voters with enough utility. As such, her utility function is associated with the social welfare function  $U = U(\Omega)$ .

In general, the lawmaker wishes to please voters and her goal is the alignment of her interest with those of the citizens. Each delegated task (i.e. each specific alignment) can be more or less convenient in terms of political gains from the lawmaker's point of view. We denote the political value she assigns to fulfil the specific task of monetary regime designing - by  $\beta_L$ , with  $0 \leq \beta_L \leq 1$ . Therefore:

$$R(U) = \beta_L U . \quad (6)$$

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<sup>33</sup> Shleifer and Vishny (2002). We assume that the political reward depend on how relevant is CBI for the citizens. On this respect the population attitude towards CBI becomes relevant; for the case of New Zealand see Hayo and Neumeier (2020). In general the relationships between information technology, voter attention and political preferences deserve further research: see Matejka and Tabellini (2020).

The alignment of incentives between the lawmaker and the citizens is a necessary and sufficient condition for finding the lawmaker's optimal behaviour. The political reward is different from the social reward as long as  $\beta_L \neq 1$ . One more step is necessary to find the effective political reward. The reward will be useful if the citizens' utility exceeds the minimum threshold of utility  $W$  that they expect from an incumbent lawmaker. This is the political competition condition. Citizens compare the lawmaker's performance with the expected performance of other politicians. The political competition condition can be defined as follows:

$$R_L = \beta_L \Pr(U \geq W). \quad (7)$$

The usefulness of the political reward will depend on this condition.

iii) Political Costs: The lawmaker knows that a higher level of monetary dominance implies fewer degrees of freedom for the incumbent governments to implement accommodative monetary policies in the future. From the lawmaker's point of view, the political costs of establishing a given level of monetary dominance depends on her expectations of facing macroeconomic situations (i.e. macro shocks or crises) during her term in office that call for a lax monetary policy that cannot be implemented given the monetary policy regime. From the citizens' point of view, the lawmaker can be a natural scapegoat in each crisis, such that the lawmaker is likely to be blamed and political costs will arise.

Therefore, the lawmaker's cost function can assume the following specification:

$$C(a) = c_L a^2 = [c_o + c_s \text{prob}S] a^2, \quad (8)$$

Where  $0 \leq [\text{prob}S] \leq 1$  represents the probability that a crisis  $S$  occurs. In other words, the political costs of the effort needed to establish a given monetary dominance regime depend on the risk of reputation losses for the incumbent legislator if a crisis occurs during her term in office. The lower the risk of becoming the political scapegoat, the lower the costs of establish a regime with higher monetary dominance will be.

A two-step process is required to establish the monetary policy regime. First, the lawmaker must define her optimal effort. Second, the monetary dominance level must be evaluated. In defining her optimal effort,  $a_L$ , the lawmaker maximizes her objective function. Then the monetary policy regime is established. In other words,  $\Omega_L$  becomes evident, such that the citizens can evaluate the institutional outcome using the social welfare function, and the final political reward can be calculated. It follows that the lawmaker maximizes social welfare net of costs of executing the task and taking into accounting her political reward:

$$\max L = R(U) - C(a) = \beta_L U - c_L(a_L) = \beta_L(a_L + \Phi) - c_L a_L^2. \quad (9)$$

From the first-order condition, the optimal effort will be:

$$\frac{\partial L}{\partial a_L} = \beta_L - 2c_L a_L = 0,$$

which implies that:

$$a_L = \frac{\beta_L}{2c_L}. \quad (10)$$

Given  $a_L$ , the lawmaker's effective political reward will depend on the condition of political competition:

$$R_L = \beta_L \Pr(U \geq W) . \quad (11)$$

Citizens are rational. They realise that the alternative to the existing lawmaker is another politician with average ability. Given their expectations,  $a^e$ , for effort, it follows that:

$$W = a^e + \Phi_{AV} . \quad (12)$$

Then:

$$R_L = \beta_L \Pr(\Phi + a_L \geq \Phi_{AV} + a^e) = \beta_L \Pr(\Phi - \Phi_{AV} > a^e - a_L) . \quad (13)$$

Nature determines the ability of the incumbent  $\Phi_L$ . It follows that:

$$R_L = \beta \Pr(\Phi_L - \Phi_{AV} > a^e - a_L) . \quad (14)$$

When rational expectations are matched (i.e.,  $a^e = a_L$ ), the effective political reward will be positive if the ability of the incumbent lawmaker is above than average:

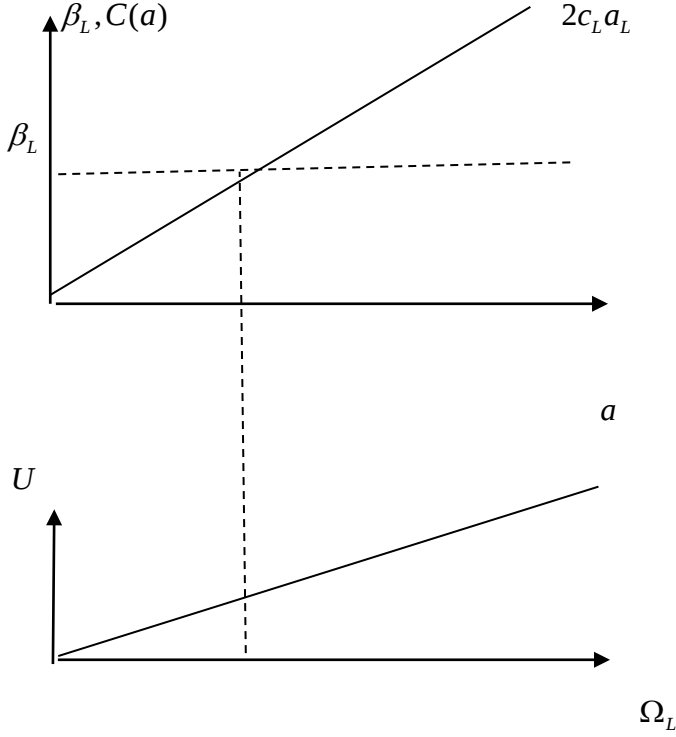
$$\Phi_L > \Phi_{AV} . \quad (15)$$

Given the above-mentioned condition (15), the equilibrium level of monetary dominance will be determined by the lawmaker's ability and effort:

$$\Omega_L = a_L + \Phi_L = \frac{\beta_L}{2c_L} + \Phi_L . \quad (16)$$

Given the exogenous lawmaker's ability, the shape of the monetary institutions will depend on the legislative preferences (Figure 1). On one hand, the level of monetary dominance will depends on the extent to which it is politically relevant for the legislature to build up monetary institutions that please society. In other words, the lawmaker's perception of the relevance of the monetary policy setting matters. On the other hand, the legislature takes into account the expected reputational costs of having rigidity in monetary affairs when macro crises arise.

FIGURE 1: MONETARY DOMINANCE AND LAWMAKER PREFERENCES



Notably, the parameter  $c_L$  can easily be used to show the conditions under which the actual level of monetary dominance can differ from the socially optimal level. In fact, we can assume that the citizens also recognize the need to address shocks in extraordinary times using the monetary accommodation, which is perfectly consistent with the aim to avoid monetary accommodation in normal times. In other words in extraordinary times the trade-off between credibility and flexibility can change. We can proxy such social sensibility assuming that the corresponding value of the parameter  $c_S$  is different from zero. Therefore it will be generally true that:

$$\text{If } c_L \neq c_S \text{ then } \Omega_L \neq \Omega_S. \quad (17)$$

Consequently, we find that exploring the legislature's preferences can be essential for understanding how the long run monetary institutions are designed when they are established. This conclusion deserves attention, especially as the extant literature considers the degree of monetary dominance as an endogenous variable that has to be explained. Various hypotheses have been advanced to explain the genesis of the political preferences that lead to given set of characteristics in

monetary institutions. In our framework, the endogeneity of the preferences can easily be captured if we assume that the legislature parameters  $\beta_L, c_L, \Phi_L$  depend on well identified drivers<sup>34</sup>.

Finally, if we relax the assumption that the lawmakers are under a veil of complete ignorance during the constitutional event (i.e. in same way that at least some of them can be involved in the monetary policy action during the policy event), then the shape of the political preferences will change. Consequently we will see a change in the corresponding level of monetary dominance, with the possibility of moving toward a fiscal dominance regime<sup>35</sup> in which fiscal policy and the corresponding policy maker become dominant<sup>36</sup>. Again, in our framework, the legislative preferences  $\beta_L, c_L, \Phi_L$  will change.

With regard to the selection of the monetary policy maker, society must decide whether to assign the task to the elected government or to a bureaucratic unit, such as the central bank. The governments' members are politicians who are motivated by the goal of pleasing voters, while the central bankers are motivated by career concerns. In other words the central bankers wish to enhance the central bank's performance because doing so improves their reputation and, consequently, their professional prospects<sup>37</sup>.

We assume that: 1) by law, the central bank's performance coincides with society's performance, (i.e. with inflation<sup>38</sup>); 2) in the long run (i.e. in "constitutional event" perspective) the market reputation of the central bank coincides with the true value of its skilled professionals; and 3) society can delegate the monetary policy task using contracts, which are based on social performances that is, in turn, verifiable. If these three assumptions hold, the central bank delegation always dominates government delegation<sup>39</sup>: the monetary policymaker is the central bank.

### 3. Short Run: Monetary Policy and Monetary Dominance

The simultaneous definition of the monetary regime and the monetary policy maker's profile realizes the delegation scheme that identifies the perimeter of the monetary policy in the second event as

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<sup>34</sup> On the endogeneity of the CBI see: Goodman (1991), Masciandaro and Spinelli (1994), Posen (1995), Cukierman and Webb (1995), de Haan and Van't Hag (1995), Sieg (1997), Lohman (1997), Berger (1997), Bernhard (1998), Bagheri and Nader (1998), Hayo (1998), Miller (1998), [Tambakis \(1999\)](#), Franzese and Robert (1999), Moser (1999), Farvaque (2002), Hallerberg (2002), [Beblavy \(2003\)](#), [Herrendorf and Neumann \(2003\)](#), [Keefer and Stasavage \(2003\)](#), Polillo and Guillén (2005), [Acemoglu et al. \(2008\)](#), Crowe (2008), Dreher et al. (2008), Dreher et al. (2010), Pistoiesi et al. (2011), Brumm (2011), Hielscher and Markwardt (2012), Berggren et al. (2014), [Enns-Jedenastick \(2014\)](#), [Artha and de Haan \(2015\)](#), Masciandaro and Romelli (2015), Fernández-Alberto (2015), Bordo and Siklos (2017), Agoba et al. (2017), Romelli (2017), Masciandaro and Romelli (2018), de Haan et al. (2018), Jost (2018), [Rossouw and Padayachee \(2019\)](#), [Hayo and Neumeyer \(2020\)](#).

<sup>35</sup> Sargent and Wallace (1981).

<sup>36</sup> Lohmann (1992), Keefer and Stasavage (2003), Hughes Hallet and Weymark (2005), Resende (2007), Hughes Hallett and Weymark (2007), Weymark (2007), Kumhof et al. (2010), Gaiotti and Secchi (2012), Bodea and Higashijima (2017).

<sup>37</sup> See: Alesina and Tabellini (2007).

<sup>38</sup> Alternatively the relationship between performance and central banking can be modelled using a bureaucratic perspective: Toma (1982), Goncharov et al. (2017).

<sup>39</sup> Alesina and Tabellini (2007). [Miller \(2016\) and \(2019\)](#) show that separating an elected fiscal authority and an unelected independent monetary authority is the institutional structure that ameliorates the time inconsistency problems.

a macroeconomic stabilization tool. From the short-run perspective, the relevant actors are the central bank and society (i.e. individual agents - households and firms). Each of these actors has goal functions, which interact simultaneously. This give rise to a Nash equilibrium<sup>40</sup>. The central bank knows the pros and cons of inflation as well the features of the institutional setting (i.e. the monetary regime<sup>41</sup>). In addition, monetary policy is the only game in town<sup>42</sup>. Then the standard goal function for the central bank, which is the social goal function - can be expressed as<sup>43</sup>:

$$V_{CB}(\pi) = (\pi - \pi^e) - \frac{1}{2} \sigma \Omega_L \pi^2 \quad . \quad (18)$$

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 the 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, the relevance of the monetary stability goal – the degree of monetary dominance - implies higher levels of the parameter  $\Omega$ .

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

$$V_{ec}(\pi^e) = -(\pi - \pi^e)^2 \quad . \quad (19)$$

If the central bank chooses the inflation rate at the same time that the individuals decide on their inflation expectations, the corresponding equilibrium is such that<sup>44</sup>:

$$\pi = \pi^e = \frac{1}{\sigma \Omega_L} \quad . \quad (20)$$

Therefore in a rational expectations setting and given the features of the economy summarized through  $\sigma^45$ , the inflation rate is associated with the monetary regime type. In other words, higher monetary dominance means lower inflation (Figure 2).

<sup>40</sup> Barro and Gordon (1983), Backus and Driffill (1985). The game theoretical approach of monetary policy overcame the weakness of the traditional monetary policy models – the macroeconomic environment is given – that the Lucas critique highlighted; see Lucas (1976).

<sup>41</sup> Eijffinger and Hoeberichts (1998).

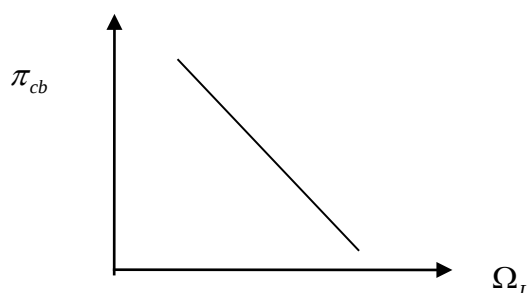
<sup>42</sup> Frequently the distinction between institutions – monetary versus fiscal dominance - and policies – monetary versus fiscal choices - is not crystal clear. Keeping this disclaimer in mind, on the presence of both fiscal and monetary policy makers see: Alesina and Tabellini (1987), Leeper (1991), Beetsma and Bovenberg (1998), Beetsma and Uhlig (1999), Dixit and Lambertini (2001), Dixit and Lambertini (2003), Adam and Billi (2008), Adam (2011), Giordano and Tommasin (2011), Martin (2011), Niemann (2011), Niemann et al. (2013), Bhattarai et al. (2014), Haga (2015), Martin (2015), Miller (2016) and (2019), Barthelemy and Plantin (2018), Rottger (2019), Bianchi and Melosi (2019). On fiscal and monetary policy makers and the monetary tool problem – money growth vs interest rate – see Neimann et al. 2013. On a historical perspective: Blancheton (2016).

<sup>43</sup> On the micro foundations of the standard goal function ascribed to the central bank see: Woodford (2003).

<sup>44</sup> Backus and Driffill (1985).

<sup>45</sup> The manner in which the economy responds to monetary policy can be related to CBI -- see Fischer (1996); in our setting:  $\sigma = \sigma(\Omega_L)$ . On the relationship between CBI and the sacrifice ratio see: Debelle and Fischer (1994), Gartner (1996), Posen (1998), Jordan (1999), Baltensperger and Kugler (2000), Cukierman (2002), Brumm and Krashevski (2003), Diana and Sidiropoulos (2004), Down (2004), Daniels et al. (2005), Katayama et al. (2019).

FIGURE 2: MONETARY POLICY AND MONETARY DOMINANCE



The inverse association between optimal inflation and monetary dominance shows why, in a rational expectations world (an assumption we maintain throughout this discussion<sup>46</sup>), society finds it in its own interest to delegate monetary policy to a specialized bureaucracy (i.e. the 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 charge. Therefore, the parameter  $\Omega$  captures the degree of central bank independence (CBI).

In this way, the role of the monetary regime in shaping the effectiveness of the monetary policy action gained momentum. As an institutional feature, CBI can be evaluated using metrics that assess the legal framework within the central bank operates. At the same time, those metrics can be used to determine whether the CBI is associated with macroeconomic performance<sup>47</sup>. In addition, the difference

<sup>46</sup> If instead of having the rational expectations assumption the individuals have beliefs – i.e. the “animal spirits” assumption holds – or more generally cognitive distortions, it is still possible to have real effects of the monetary policy action, without the need to postulate that nominal rigidities are present; see: Farmer and Platonov (2019), Angeletos and La’O (2019). On central bank independence and beliefs see: Henckel et al. (2011).

<sup>47</sup> Banaian et al. (1983), Bade and Parkin (1988), Alesina (1989), Grilli et al. (1991), De Long and Summers (1992), Alesina and Summers (1993), Cukierman et al. (1993), Alesina and Gatti (1995), Jonsson (1995), Campillo M. and Miron J., (1996), Fujiki (1996), Lougani and Sheets (1997), Walsh (1997), Akhand (1998), Sikken and de Haan (1998), Banaian et al. (1998), Cukierman and Lippi (1999), Oatley (1999), Maliszewski (2000), Banaian and Luksetich (2001), Gutierrez (2003), Demertzis (2004), Ismihan and Ozkan (2004), Brumm (2006), Crowe and Meade (2008), Dolmas et al. (2000), Keefer and Stasavage (2003), Efthimiadis (2007), Daunfeldt and de Luna (2008), Down (2008), Hasan and Mester (2008), Hayo and Voigt (2008), Jácome and Vázquez (2008), Klomp and de Haan (2009), Alpanda and Honig (2009), Carlstrom and Fuerst (2009), Klomp and de Haan (2010b), Maslowska (2011), Chrigui et al. (2011), Forch and Sunde (2012), Kurihara et al. (2012), Spyromitros and Tuysuz (2012), Arnone and Romelli (2013), Bodea (2013), Cargill (2013), Posso and Tawadros (2013), Dincer and Eichengreen (2014), Nolivos and Vuletin (2014), Alpanda and Honig (2014), Doumpos et al. (2015), Bodea and Hicks (2015), Burdekin and Laney (2016), Garriga (2016), Aguir (2017), Kamanga and Chikonda (2017), Papadamou et al. (2017a), Iwasaki and Uegaki (2017), Gavin (2018), Nurbayev (2018), Garcia and Costa (2019), Kokoszczyński and Mackiewicz-Lyziak (2019), Aklin and Kern (2019), Garriga and Rodriguez (2019), Koziuk (2019), Noh (2019), Peia O. and Romelli D. (2019). On CBI as instrumental variable see: Fisher (1993), Barro (1995). On CBI as control variable see: Cukierman and Lippi (1999) (inflation and labour market), Dolmas et al. (2000) (inflation and inequality), King and May (2001) and Neyapti (2004) (inflation and fiscal decentralization), Alpanda and Honig (2014) (inflation and inflation targeting), Papadamou et al. (2017b) (market conditions and public debts), Garriga and Meseguer (2019) (floating exchange rate and remittances). On instrumental variables for CBI see Crowe and Meade (2008) and Lim (2020). For a critical view: McCallum (1995), Bibow (2004), Ismihan and Ozkan (2004), Hartwell (2018).

between legal and factual CBI<sup>48</sup> has been acknowledged. Actual practices can differ from formal procedures, especially (but not exclusively) in emerging and in transition countries. Moreover CBI has been considered a crucial variable in explaining the political decisions that shape the financial supervisory setting<sup>49</sup>.

Finally, it is worth noting that other cases of monetary dominance regimes are possible. Consider, for example, fixed exchange rate architectures, that includes currency board arrangements, in which society establishes an international setting that ties the 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 credibility<sup>50</sup>.

#### 4. People Matter: Central Banker Conservatism

The extant literature took another step by focusing the economic analysis 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 unique proxy that represented the importance of monetary stability in the policy maker's goal function – our parameter  $\Omega$ . 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 personal feature of the central banker as bureaucrat, as delegating monetary policy to a player who is inflation averse represents further commitment to increasing the monetary policy's credibility, then its effectiveness in terms of inflation performance. In the literature, CBI and CBC are two distinct and relevant ingredients in central bank governance focused on an effective monetary policy. In general CBI and CBC are viewed as substitutes<sup>51</sup>.

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

$$V_{cb}(t_{cb}, \pi) = B(t_{cb}, \pi) - C(t_{cb}, \pi) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2}\sigma\Omega_L t_{cb}\pi^2, \quad (21)$$

<sup>48</sup> Cukierman et al. (1992), Cukierman et al. (2002), Keefer and Stasavage (2003), Cobham et al. (2008), Hayo and Voigt (2008), Siklos (2008), Alpanda and Honig (2009), Dreher et al. (2010), Klomp and de Haan (2010a), Chrigui et al. (2011), Maslowska (2011), Vuletin and Zhu (2011), Enns-Jedenastick (2014), Nolivos and Vuletin (2014), Artha and de Haan (2015), Binder (2018), Strong (2019).

<sup>49</sup> Masciandaro (2005), (2007) and (2009), Dalla Pellegrina et al. (2013), Melecky and Podpiera (2013), Masciandaro and Volpicella (2016), Masciandaro and Romelli (2018).

<sup>50</sup> On the relationships between CBI and fixed exchange regime see: de Haan et al. (1993), Hayo and Hefeker (2002), Bodea (2010), Bodea (2014), Ftiti et al. (2017); on CBI and currency boards see de Haan et al. (2001); on CBI and dollarization see Drazen (2002).

<sup>51</sup> Eijffinger and Hoeberichts (1998), Hughes Hallet and Weymark (2005), Eijffinger and Hoeberichts (2008), Hefeker and Zimmer (2011), Taylor (2013), Darabi and Samimi (2016).

where  $B(t_{cb}, \pi)$  and  $C(t_{cb}, \pi)$  are the individual benefits and costs<sup>52</sup>, respectively;  $\Omega_L$  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:

$$\frac{\partial B(t_{cb}, \pi)}{\partial \pi} = \frac{1}{\sqrt{\pi} t_{cb}} > 0; \quad \frac{\partial^2 B(t_{cb}, \pi)}{\partial \pi^2} = -\frac{1}{2\pi^{3/2} t_{cb}} < 0 \quad , \quad (22)$$

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

In fact, given a basic central bank balance-sheet constraint,<sup>53</sup> we know that when  $d$  is the real dividend the central bank pays to the state,  $h$  is the flow of currency and  $\theta$  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 the central banker cares about her personal reputation:

$$\frac{\partial C(t_{cb}, \pi)}{\partial \pi} = \sigma \Omega_L t_{cb} \pi > 0; \quad \frac{\partial^2 C(t_{cb}, \pi)}{\partial \pi^2} = \sigma \Omega_L t_{cb} > 0 \quad . \quad (23)$$

Finally, we assume that the central bankers can be heterogeneous with respect to their degree of conservatism, which is common knowledge<sup>54</sup>. 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:

$$\frac{\partial B(t_{cb}, \pi)}{\partial \pi} = -\frac{2\sqrt{\pi}}{t_{cb}^2} < 0; \quad \frac{\partial C(t_{cb}, \pi)}{\partial \pi} = \frac{\sigma \Omega_L \pi^2}{2} > 0. \quad (24)$$

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

$$\frac{\partial B(t_{cb}, \pi)}{\partial \pi} = \frac{\partial C(t_{cb}, \pi)}{\partial \pi}; \quad \frac{1}{\sqrt{\pi} t_{cb}} = \sigma \Omega_L t_{cb} \pi \quad (25)$$

<sup>52</sup> Here we adapt a general goal function - see: Alesina and Passarelli (2019) – to describe the central banker behavior.

<sup>53</sup> It has been shown and claimed - Jeanne and Svensson (2007), Stella and Lonnberg (2008), Hall and Reis (2015), Reis (2015), Benigno (2016), Adler and Castro (2016), Goncharov et al. (2017), Kjellberg and Vestin (2019) - that profit and capital concerns are both present and effective in central banker choices (i.e. the central banker cares about the so-called central bank financial independence).

<sup>54</sup> On uncertainty and central banker's preferences see: Beetsma and Jensen (1998), Muscatelli (1998), Lossani et al. (1998), Tillman (2008), Sorge (2013), Morimoto (2018).

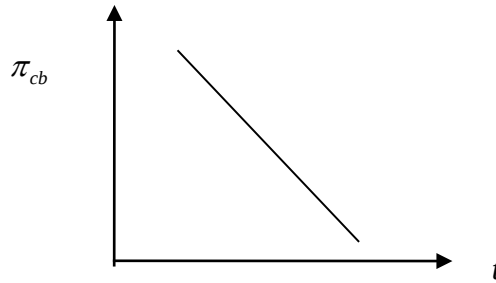
Then:

$$\pi_{cb} = \frac{1}{t_{cb}^{4/3} \sigma^{2/3} \Omega_L^{2/3}} \quad (26)$$

Inflation and CBC are inversely associated. The same is true for inflation and CBI - lower risk of monetary policy captures 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) also means lower inflation. As in the case of CBI, researchers have developed indices of CBS, where the more correct analyses discuss or use separate indicators for independence and conservatism<sup>55</sup>.

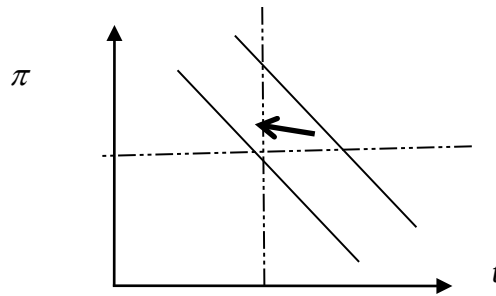
Graphically, the inflation rate is inversely correlated with the degree of CBC (Figure 3):

FIGURE 3: MONETARY POLICY AND CENTRAL BANK CONSERVATISM



It is evident that 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, which implies that, given the institutional reform, the same level of inflation is associated with a lower level of conservatism (Figure 4).

FIGURE 4: MONETARY POLICY AND CENTRAL BANK INDEPENDENCE



<sup>55</sup> Forder (1996), de Haan and Kooi (1997), Vaubel (1997), Forder (1998), Fry (1998), Clarida et al. (2000), Favero and Rovelli (2003), Ozlale (2003), Castelnovo and Surico (2004), Berger and Woitek (2005), Krause and Mendez (2005), Dennis (2006), Berlemann and Hielscher (2013), Leveuge and Lucotte (2014), Berlemann and Hielscher (2016). On the relationships between central banker types and stock market reactions see Kuttner and Posen (2010), Moser and Dreher (2010).

In this regard, this result overtakes a well-known finding that it is optimal to hire a central banker who is more conservative than the average citizen<sup>56</sup>. In a sense, the optimal level of conservatism becomes a state- contingent variable given the institutional setting<sup>57</sup>,  $\Omega$ , as well as the structural features,  $\sigma$  of the economy<sup>58</sup>.

During the constitutional event the hiring of the optimal central banker will be based on the same delegation process identified in the previous step, but taking the fact that we are now considering personal skills and incentives into account. If we assume that the central banker's performance is verifiable, coincides with social performances and is consistent with the true value of her skills, then the central banker delegation always dominates politician delegation, if we follow to assume that the politicians have their own political cost and benefit analysis.

Obviously, the more the above- mentioned assumptions are relaxed, the more the lawmakers will struggle to monitor the central banker's performance. Therefore, the need for effective performance measures is an interesting issue in the design of optimal central-banker contracts<sup>59</sup>. The performance metrics can be focused on goals, as in the case of inflation targeting<sup>60</sup>, or on tools, as is the case with a legislated instrument norm based on Taylor-type rules<sup>61</sup>. Again, the more lawmakers in the constitutional event and governments in charge in the policy events are overlapped, the more political distortions are likely to emerge in the central banker selection.

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 normalized both the sacrifice ratio and the degree of CBI to one. Therefore the central banker's utility function becomes:

$$V_{cb}(t_{cb}, \pi) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2}t_{cb}\pi^2, \quad (27)$$

And the preferred inflation rate is equal to:

$$\pi_{cb} = \frac{1}{t_{cb}^{4/3}}. \quad (28)$$

Notably, conservatism is associated with a particular jargon 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 (28), over time, this

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<sup>56</sup> Brainard (1967), Rogoff (1985), Hughes Hallet and Proske (2018).

<sup>57</sup> The institutional setting includes the features of central banker office, as the term length: see Waller and Walsh 1996.

<sup>58</sup> Svensson (1999), Ball (1999), Lippi (2002). On CBI and CBC in an economy with liquidity traps see respectively: Jeanne and Svensson (2007), Nakata and Schmidt (2019).

<sup>59</sup> Persson and Tabellini (1993), Walsh (1995a) and (1995b), Fratianni et al. (1997), Svensson (1997), Herrendorf and Lockwood (1997).

<sup>60</sup> Svensson (1997), Beetsma and Jensen (1998).

<sup>61</sup> Walsh (1995c).

differentiation between doves and hawks has become one of the main focal areas in the analysis of **the relationships between** monetary policy decisions **and macroeconomic performances**<sup>62</sup>.

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<sup>63</sup>; gender<sup>64</sup>; education, occupational background and political preferences<sup>65</sup>; personal experiences<sup>66</sup>; or a combination of these drivers<sup>67</sup>. 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 feature that matters in shaping the monetary preferences and that female central bankers generally adopt a more hawkish approach to monetary policy, then optimal inflation rate will be lower when a female central banker is in charge:

$$\pi_{cb} = \frac{1}{t(\gamma)^{4/3}}, \text{ where } \gamma \text{ represents the central banker gender.}$$

## 5. Ex Pluribus Unum: Monetary Policy and Central Bank Committees

Today monetary policies are designed and implemented by committees<sup>68</sup>. This feature of central bank governance can influence monetary policy decisions. What are the consequences when monetary policy is made by committees instead of by a single central banker? The monetary policy outcome becomes the endogenous result of the interactions between the central bank's practices, with a particular attention paid to voting protocols, and the preferences of the central bank's board members<sup>69</sup>. These two features - preferences and how to aggregate them –can be discussed separately.

Starting from 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

<sup>62</sup> Eijffinger and Masciandaro (2018), Kahn and Oksol (2018), Istrefi et al. (2019). On conservatism and central bank communication see: Tobback et al. (2017), Apel et al. (2019).

<sup>63</sup> Meade and Sheets (2005), Chappell et al. (2008), Eichler and Lahner (2014), Jung and Latsos (2015).

<sup>64</sup> Masciandaro et al. (2015), Diouf and Pepin (2017).

<sup>65</sup> Belden (1989), Havrilesky and Gildea (1991), Farvaque et al. (2006), Gohlmann and Vaubel (2007), Besley et al. (2008), Hansen and McMahon (2008), Gerlach-Kristen (2009), Farvaque et al. (2011), Belke and Potrafke (2012), Adolph (2013), Neuenkirch and Neumeier (2015), Eichler and Lahner (2017), Farvaque et al. (2018), Bordo and Istrefi (2018), Mishra and Reshef (2019).

<sup>66</sup> Malmendier et al. (2017).

<sup>67</sup> Eichler and Lahner (2018), Bennani et al. (2018).

<sup>68</sup> Lybek and Morris (2004), Sibert (2006), Frisell et al. (2008); see also Hasan and Mester (2008).

<sup>69</sup> Bullard and Waller (2004), Lombardelli et al. (2005), Dal Bo (2006), Mihov and Sibert (2006), Montoro (2007), Eslava (2010), Riboni (2010), Riboni and Ruge-Murcia (2008), Riboni and Ruge-Murcia (2010) and (2019), Volcker (2016), Van Ommeren and Piccillo (2019).

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 her own goal function  $V_j(t_j, \pi)$ :

$$V_j(t_j, \pi) = \frac{2\pi^{0.5}}{t_j} - \frac{1}{2}t_j\pi^2, \quad (29)$$

- b) Each MPC member chooses her preferred inflation rate  $\pi_j$ .

This is where the importance of voting protocols enters the picture. In order to highlight their relevance, let us assume in our two- event framework that in the stage one (the “constitutional” event) the voting protocols are unknown because Nature will randomly define them in stage two. The rationale is simple: the voting protocols are the final, intertwined outcome of formal voting rules with actual bargaining among the board members where the distinction between the two components – procedures and bargaining – is also ambiguous in the concrete central banking practices<sup>70</sup>. In other words, the institutional procedures alone cannot unambiguously reveal how the monetary policy committee will reach decisions. Although formal voting relies on a given rule, committees can function under a different norm of agreement in practice.

As usual, the lawmakers act as social planners. They will nominate the  $N$  board members, taking the heterogeneity in the individual preferences into account. The optimal monetary policy will be obtained by optimizing the sum of the preferences of the individual central bankers:

$$\sum \frac{2\pi^{0.5}}{t_j} - \frac{1}{2}t_j\pi^2. \quad (30)$$

Where the average inflation,  $\pi_a$ , 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:

$$\frac{1}{\sqrt{\pi t_a}} = t_a \pi. \quad (31)$$

During the policy event, Nature plays its role and the actual inflation rate will depend on the adopted voting protocol. For example, let us assume that:

- c) The board votes using a majority rule. The monetary policy outcome is therefor the median type's preferred inflation rate,  $\pi_m$ . The inflation rate in equilibrium will be inversely correlated with the conservatism  $t_m$  of the median central banker<sup>71</sup>:

<sup>70</sup> Fry et al. (2000), Dal Bo (2006), Crowe and Meade (2007), Riboni and Ruge-Murcia (2010).

<sup>71</sup> Riboni and Ruge-Murcia (2010). See also: Hellier (1999).

$$\pi_m = \frac{1}{t_m^{4/3}} . \quad (32)$$

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

$$\text{If } t_m \neq t_a \text{ then } \pi_m \neq \pi_a . \quad (33)$$

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 be different. Consequently, when monetary committees enter the picture, voting protocols matter given that how the preferences are aggregated determines the actual monetary policy outcome.

In terms of the board members' preferences, given the above-mentioned discussion on whether and how conservatism and its drivers matter<sup>72</sup>, 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<sup>73</sup>. 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 or studies of individual reaction functions, is now widespread<sup>74</sup>.

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 equal to:

$$\pi_m = \frac{1}{t_m(\delta)^{4/3}} , \quad (34)$$

Where  $\delta$  represents the board diversity.

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<sup>72</sup> Hefeker and Zimmer (2014), Morimoto (2018).

<sup>73</sup> Blinder and Morgan (2005), Blinder (2007), Riboni and Ruge-Murcia (2008), Besley et al. (2008), Blinder and Morgan (2008), Hansen and McMahon (2008), Gerlach-Kristen (2009), Hix et al. (2010), Bhattacharjee and Holly (2010), Eijffinger et al. (2013a), and (2013b), Eijffinger et al. (2015).

<sup>74</sup> Chappell and Mc Gregor (1993), Patra and Samantaraya (2007), Harris and Spencer (2009), Harris et al. (2011).

## 6. When Central Bankers become Humans: Behavioural Monetary Policymaking

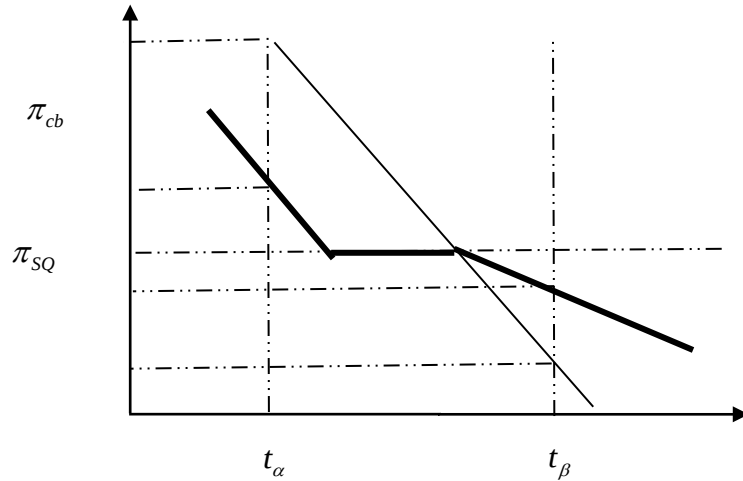
In general the analysis of the central bankers' behavior is based on the assumption that they are standard rational decision-making. Recently monetary policymaking became a topic of behavioral research<sup>75</sup>, introducing heuristic principles, or biases<sup>76</sup>. In this background it is interesting the application of the prospect theory, which thus far “remains the most important theoretical contribution to behavioral economics”<sup>77</sup>. We assume the presence of loss aversion, such that the central bankers that are taking decisions inside a monetary policy committee perceive any outcome as expected gains and losses relative to a reference point, which represents their endowment and it coincident with the “status quo”<sup>78</sup>, i.e. the actual inflation rate.

We assume that when loss aversion affects the central bank behaviour costs loom larger than benefits for every monetary policy choice and that both are evaluated with respect to the status quo inflation. Let  $\pi_{SQ}$  be the status quo inflation and  $z > 0$  the parameter that captures loss aversion. With loss aversion the central banker becomes particularly prudent, from two symmetric 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, but with loss aversion higher inflation costs yield psychological losses that amount to:

$$z \left[ C(t_{cb}, \pi) - C(t_{cb}, \pi_{SQ}) \right] = z \frac{1}{2} t_{cb} (\pi^2 - t_{SQ}^2) \quad (35)$$

FIGURE 5: MONETARY CONSERVATISM WITH LOSS AVERSION



<sup>75</sup> Favaretto and Masciandaro (2016), Khan (2018), Haldane (2018), Salter and Luther (2019), Krokida et al. 2020.

<sup>76</sup> Kahneman (2003).

<sup>77</sup> See: Thaler R.H., (2018).

<sup>78</sup> See: Tversky A. and Kahneman D., (1992), Barberis N.C., (2012), Barberis N.C., (2013).

$t$

In other words, with loss aversion, when  $\pi > \pi_{SQ}$ , the central banker becomes relatively more hawkish - intuitively see for example the central banker with conservatism  $t_\alpha$  in Figure 5 - given that the loss averse central banker overestimates inflation costs.

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 that costs overall, with psychological losses in terms of benefits amounting to:

$$z \left[ B(t_{cb}, \pi_{SQ}) - B(t_{cb}, \pi) \right] = z \frac{2\pi^{0.5}}{t_{cb}} (\pi_{SQ}^{0.5} - t\pi^{0.5}) \quad (36)$$

With loss aversion, when  $\pi < \pi_{SQ}$  each central banker – in Figure 5 again see for example the central banker with conservatism  $t_\beta$  - becomes relative more dovish, given that the loss averse central banker underestimates monetary stability benefits.

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

$$V_{cb}(t_{cb}, \pi / \pi_{SQ}) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2}t_{cb}\pi^2 - \frac{1}{2}zt_{cb}(\pi^2 - t\pi_s^2) \quad \text{if } \pi > \pi_s, \quad (37)$$

And

$$V_{cb}(t_{cb}, \pi / \pi_{SQ}) = \frac{2\pi^{0.5}}{t_{cb}} - \frac{1}{2}t_{cb}\pi^2 - z \frac{2\pi^{0.5}}{t_{cb}} (\pi_{SQ}^{0.5} - t\pi^{0.5}) \quad \text{if } \pi < \pi_s. \quad (38)$$

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

$$\frac{1}{\pi^{0.5}t_{cb}} = (1+z)t_{cb}\pi \quad \text{and} \quad \pi_H = \frac{1}{t^{4/3}(z+1)^{2/3}} \quad \text{if } \pi > \pi_{SQ} \quad (39)$$

$$\frac{1}{\pi^{0.5}t_{cb}} = t_{cb}\pi \quad \text{and} \quad \pi_{SQ} = \frac{1}{t^{4/3}} \quad \text{if } \pi = \pi_{SQ} \quad (40)$$

$$(1+z)\frac{1}{\pi^{0.5}t_{cb}} = t_{cb}\pi \quad \text{and} \quad \pi_D = \frac{(z+1)^{2/3}}{t^{4/3}} \quad \text{if } \pi < \pi_{SQ} \quad (41)$$

Given the status quo inflation, the conservatism of the prudent central banker is going to remain in a corridor, where the lower and the upper limits represent respectively the doves and the hawks. Discounting

the aversion for the inflation risks – condition (37) - in equilibrium the prudent dovish central banker will be characterized by a level of conservatism  $t_D$ , such that:

$$\frac{\partial B(t_D, \pi)}{\partial \pi} = (1+z) \frac{\partial C(t_D, \pi)}{\partial \pi}, \text{ i.e.: } \frac{1}{\pi^{0.5} t_D} = (1+z) t_D \pi, \quad (42)$$

Where:

$$t_D = \frac{1}{\pi^{0.5} \sqrt{\pi^{1/2} z + \pi^{1/2}}}. \quad (43)$$

At the opposite 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:

$$(1+z) \frac{\partial B(t_H, \pi)}{\partial \pi} = \frac{\partial C(t_H, \pi)}{\partial \pi}; \text{ i.e.: } \frac{(1+z)}{\pi^{0.5} t_H} = t_H \pi, \quad (44)$$

Where:

$$t_H = \frac{\sqrt{\frac{z}{\pi^{1/2}} + \frac{1}{\pi^{1/2}}}}{\pi^{1/2}} \quad (45)$$

As it has been expected  $t^D < t^H$  - the dovish attitude and the hawkish attitude represent the bounds of the corridor of central bank prudence. Therefore each central banker  $j$  will set her preferred inflation  $\pi_j$ , given her level of conservatism  $t_j$  according to the following rule:

$$\pi_D = \frac{(z+1)^{2/3}}{t^{4/3}} \text{ if } t_j < t_D, \quad (46)$$

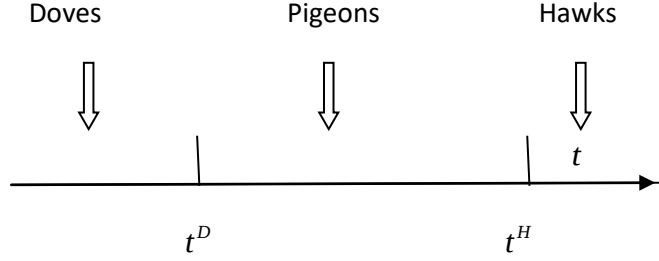
$$\frac{1}{\pi^{0.5} t_{cb}} = t_{cb} \pi \text{ if } t_D < t_j < t_H, \quad (47)$$

$$\pi_H = \frac{1}{t^{4/3} (z+1)^{2/3}} \text{ if } t_j > t_H \quad (48)$$

The introduction of loss aversion produce a novel result regarding the diversity of a monetary committee. Now every central bank board can be divided into in three groups: doves ( $ift_i^d < t^d$ ), hawks ( $ift_i^h > t^h$ ) and pigeons ( $ift_i^d < t^d < t^h$ ) (Figure 6) <sup>79</sup>.

<sup>79</sup> This classification has been introduced in Favaretto and Masciandaro (2016).

FIGURE 6: CENTRAL BANKER TYPES: DOVES, PIGEONS AND HAWKS

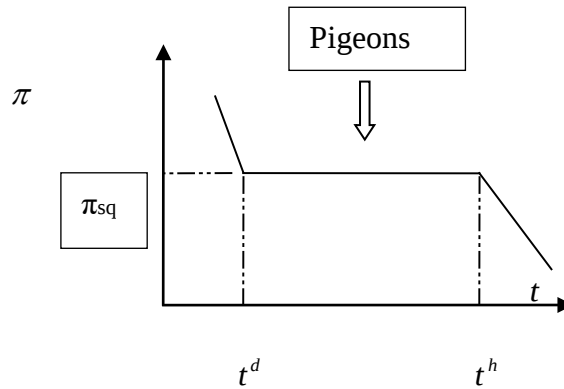


Each board member expresses well-defined inflation preferences, but now, with respect to the situation without psychological distortion: i) each central banker evaluates any policy in terms of changes from the monetary policy status quo and ii) any negative effect of a change with respect to the status quo will loom larger than a positive effect of equal magnitude. But 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,  $\pi_m$ . Therefore, the preferred inflation rate will depend on median conservatism,  $t_m$ , which has now three possibilities: dove, pigeon and hawk. More precisely, three different equilibria can arise (Figure 7):

$$\pi > \pi^s \text{ if } t_m < t^D, \pi = \pi^{SQ} \text{ if } t^D < t_m < t^H, \pi < \pi^{SQ} \text{ if } t_m > t^H. \quad (49)$$

FIGURE 7: MONETARY POLICY AND CENTRAL BANKER TYPES



The existence of loss aversion can sensibly influence monetary decisions through the *inertia effect*: The policy outcome will be the status-quo inflation,  $\pi^s$ , 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 between 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, to classify the diversity of preferences the traditional distinction, based on labels like hawks and doves, can be enriched with the pigeons, where a pigeon is a central bank member that avoid to decide between assigning high importance to monetary stability or supporting the use of monetary policy for other macroeconomic purposes. Finally, this classification can be useful to analyse a fourth central bank type: the swingers<sup>80</sup>. An empirical investigation<sup>81</sup> identified as swingers those central bankers who switched type over their tenure. In our framework the importance of the swingers depends on how relevant is the change in the individual preferences. In fact the swingers emerge when a change in the conservatism distribution occur. Let us call  $\theta$  the shock in preferences; this shock will produces swingers, as well as a change in the prudence corridor, where  $t_n^D, t_n^H$  are respectively the new lower and upper bounds, while  $t_{nm}$  is the conservatism of the new median central banker. Now, 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 irrelevant. The swingers matter when the shock  $\theta$  is relatively large, i.e. when either  $\theta > t_n^H - t_{nm} \geq 0$  or  $\theta < t_n^D - t_{nm} \leq 0$ . Such result can be useful in interpreting the existent evidence of the swingers. For example, the empirical results on the FED case<sup>82</sup> show relevant swings during the early to mid-1970s and during the 1990s to the mid-2000s, supporting the assumption that times of economic hardship – i.e. a big  $\theta$  in our framework – can shape the preferences of the central bankers; life experience – which is one more psychological factor – is likely to matter<sup>83</sup>.

## 7. Central Bankers and Financial Stability

Economists and policymakers who are debating about the future of monetary policy usually focus on the following question: How does financial stability affect the central bankers' decisions regarding monetary policy? Since the Great Crisis, promoting financial stability has been a general priority. In

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<sup>80</sup> Bordo and Istrefi (2018).

<sup>81</sup> Istrefi (2017).

<sup>82</sup> Malmendier et al. (2017), Bordo and Istrefi (2018).

<sup>83</sup> Istrefi (2017).

thinking about ways to prevent financial disasters in the future, it has been natural to look at the financial consequences of the monetary policy action. It has been claimed<sup>84</sup> that central bank independence, inflation targeting and financial stability represent the major changes in the monetary policy landscape in the last decades.

The problem is that it is far from clear whether and how the overall effectiveness of the monetary policy action is associated with the developments in the banking and financial sectors. Monetary policy and financial variables are linked through a series of two ways relationships, that can be considered time to time either complementary or conflicting rings in the overall chain that goes from the central bank choices to the macroeconomic stabilization purposes<sup>85</sup>. In a nutshell, the state of financial stability can represent a source of uncertainty – financial stability uncertainty - that can influence the decision of the central bankers. Then the question becomes: How central bankers make their choice when there is a source of financial stability uncertainty that can hit the monetary policy outcomes?

Consider a monetary policy choice when a source of financial stability uncertainty can change the overall expected outcomes: monetary policy and financial stability are associated, but their true relationship is unknown. On the one hand, for any level of the inflation rate  $\pi$ , the benefits depend on a random variable  $\Psi$ , i.e. the gains from central bank involvement in financial stability issues. On the other hand, losses from the involvement of the central banker in financial stability can occur; size and likelihood of such as losses are captured through another random variable  $\Delta$ . The central bankers know the distribution of both benefits and costs. We assume that financial stability uncertainty influences just the central banker benefits; needless to say that simplification is irrelevant: uncertainty can hit both benefits and costs with different weights without any change in our results.

Focusing on the role of financial stability uncertainty, we assume that its features are homogenous across the board members – all the board members homogeneously agree that the financial stability pattern is a relevant source of uncertainty - and therefore the function is the same for all the central bankers:

$$B(t_i, \pi, \Psi, \Delta) = B(t, \pi, \Psi, \Delta) . \quad (27)$$

The utility of the central banker becomes:

$$V_j(t_j, \pi, \Psi, \Delta) = \frac{2\pi^{0.5}\Psi}{t_j\Delta} - \frac{1}{2}t_j\pi^2 \quad (28)$$

From the optimality conditions the preferred inflation rate will be :

$$\pi_j = \frac{\Psi^{2/3}}{t^{4/3}\Delta^{2/3}} \quad (29)$$

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<sup>84</sup> Reis (2018).

<sup>85</sup> Woodford (2012), Brunnermeier and Sannikov (2014), International Monetary Fund (2015), Svensson (2015), Beyer (2017), Baker et al. (2018); for an historical perspective on the relationship between monetary regimes and financial stability see Bordo (2018). For a theoretical model on CBI and financial stability see Berger and Kijmer (2013). On banking bailouts and CBI see Rosas (2006).

Therefore, in defining the optimal monetary policy stance the central banker must address the unpleasant and uncertain trade-off between expected costs and benefits that the involvement in financial stability issues implies. This result deserves merit at least for its capacity to summarize in a formula a long standing debate which is still on going in the literature<sup>86</sup>.

The crucial point is that the academia offers two main and contradictory results, which can be summarised as opposite answers to the following question: Given two policies – monetary policy and macro supervision policy – with two different macro goals, what is the optimal degree of involvement for the monetary agent (i.e. the central bank) in supervisory responsibilities? So far two answers has been offered: the integration view versus the separation view.

The *integration view* is based on three different categories of arguments: information gains, skill gains and independence gains. The integration view suggests that the more the central bank gains information, the more its leading role in the definition and implementation of macro supervision is supported. Among other things, such as gains can also increase the probability that the coordination between monetary and macro-prudential policies is more like to occur, notwithstanding it is worth noting that the coordination between the two policies can present macroeconomic downside. In other words, having the central bank as the leading actor in both policies increases the likelihood that Tinbergen's principle (i.e. consistency between different goals and different tools) is respected.

The integration view is also based on the fact that the central banker is the country's liquidity manager, and that he or she obtains information on the health of the banking and financial system by carrying out that role. As sources of liquidity, central banks naturally serve as leaders in preventing and managing systemic banking crises in advanced, emerging and developing countries. Moreover, other government agencies entrusted with responsibility for financial stability serve as the central bank's *de jure* or *de facto* subordinates.

At the same time also the downside risks in having in the same hands both policies can be increased by the fact that the central bank is the liquidity manager. The boundaries between the central bank's role as liquidity manager and the government's solvency support for banking and financial institutions have been blurred, inevitably triggering a debate on the shape of central bank settings, especially with regard to the features of the central bank independence.

The central bank's leading role in macro supervision is also supported by arguments related to the skill gains and economies of scale gains, that derive from bringing all functions together under the same umbrella. Finally it has been claimed the importance of assigning the macroprudential policy function to independent agencies with technical expertise, i.e. an institutional profile that – at least in the advanced economies – usually matches the central bank characteristics.

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<sup>86</sup> For the debate on "integration vs separation" see: Masciandaro and Quintyn (2015), Svensson (2017), Lazopoulos and Gabriel (2019).

On the opposite side *the separation view* is essentially based on three different categories of arguments, which has been partially already mentioned in illustrating the integration view: tool misallocation risks, goal overriding risk, super-bureaucracy risks.

First of all the separation view claims that if the central bank is the leading macro supervisor, there is a risk that both the instruments of one policy can be assigned to the wrong objectives, and/or organizational dysfunctions can arise (tool misallocation risk). The misallocation risk can arise when the central bank, having macroprudential responsibilities, uses the monetary policy tools to pursue financial stability goal, as in the case of the “Leaning Against the Wind” policies.

At the same time, when the central bank is the main actor responsible for maintaining financial stability, the risk of goal overriding risk – the likelihood that financial stability concerns will undermine both the central bank’s credibility and effectiveness as the monetary authority – can increase.

Further, an additional driver of the actual role of the central bank in macro supervisory governance is its political role as an independent authority: politicians may fear creation of an overly powerful bureaucracy, i.e. the existence of a super-bureaucracy risk, especially given that implementation of effective macro supervision action is often believed to require constrained discretion.

All in all, the literature suggests that when selecting the optimal level of central bank involvement in financial stability issues, policymakers face an unpleasant trade-off. On the one hand, there are potential net gains, which can be influenced from that fact that the central bank is also deeply involved in micro supervision. On the other hand, risks of capture, policy tool misallocation and an overly powerful bureaucracy arise. Notably, economic and econometric analyses of the relative merits of assigning the central bank a leading role in macroprudential governance are so far rare<sup>87</sup>.

## 8. Conclusions

This paper has discussed the evolution of the theory of monetary policy design since the 1980s, To do so, it has been used the relationships among central bank governance, central banker preferences and monetary policy choices as an interpretive key. Three subsequent **and intertwined** stages were identified. First, the central bank emerged as an independent institution. Second, conservative central bankers were viewed as bureaucrats who used committees to make monetary policy decisions. Third, research focused on the fact that psychology matters for explaining how central bankers reach their decisions.

The article started with a discussion of the general evolution of economic thought on monetary policy as a story of two intertwined tales: how to design central bank governance for the longer term and how central bankers manage monetary policy in the short run. In this discussion, both central bank independence and central banker conservatism emerged as fundamental features from preventing the myopic use of monetary policy. In addition, central bankers were viewed as “Econs” – rational players in the sense of the traditional economic mainstream. Then central bankers become individual bureaucrats that use committees to take monetary policy decisions. Finally the paper discussed the emergence of the behavioural perspective and explored the monetary policy consequences of the fact that central bankers

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<sup>87</sup> Borio and Shim (2007), Lima et al. (2016).

are “humans”, as loss aversion can distort their decisions. The methodological aim was to show how the perspectives associated modern economics, political economy and behavioural economics can serve as fruitful and complementary tools when analysing the design and implementation of monetary policy.

In this respect, it is worth noting that the behavioral approach deserves further explorations. In general, central bankers are subjected to the same sources of behavioural bias that all individuals face. In the presence of behavioural biases, the outcome of different information sets and/or governance rules can differ. At the same time, the same governance rules are based on the assumption that a principal-agent framework exists between citizens and central bankers as bureaucrats, where the bureaucrats are rational players. Therefore, the governance challenge is to design rules of the game that can produce optimal interest alignment between society and central bankers.

Other perspectives also need to be explored. Loss aversion may explain may delays and lags in changing the monetary policy stance. In other words, central bankers can justify their lack of active choices using informational reasoning (e.g., “we adopted a data-dependent strategy”) or by pointing to governance drivers (e.g., “we need to reach a greater consensus”). As they are simultaneously bureaucrats (i.e., career-concerned players) and humans, other possibilities need to be explored. including the possibility that central bankers act in a manner consistent with **other** behavioural biases.

Notably, loss aversion is just one source of behavioural bias. As it has been pointed out<sup>88</sup>, the cognitive psychology perspective can be utilised to understand the intertemporal challenges embedded in monetary policy analysis. Therefore, the analysis of central bank governance must take the potential relevance of behavioural biases into account<sup>89</sup>. Future research should devote additional effort to uncovering the relationship between behavioural biases and alternative governance settings.

Central bank communication is another field that could be reshaped by using behavioral insights<sup>90</sup>. **Finally it is worth noting that in the decision making of the central banks other bodies than the Monetary Policy Committee are likely to deserve more attention**<sup>91</sup>.

**In general, the Great Crisis has reopened the debate on the optimal monetary policy design. The implementation of extraordinary monetary policy coupled with a higher degree of involvement in financial supervision in almost all advanced economies posed a series of questions that have brought again the CBI issue to the forefront of policy and academic debate. The concept of CBI follows to attract interest from the research. Figure 8 shows the constant interest in CBI by displaying the number of scientific articles published in peer reviewed journals with a title containing these keywords between 1991 and 2020; 150 articles were published, with three peaks in 1998, 2008 and 2018. It is worth noting that recent years have seen a renewed attention in studying CBI.**

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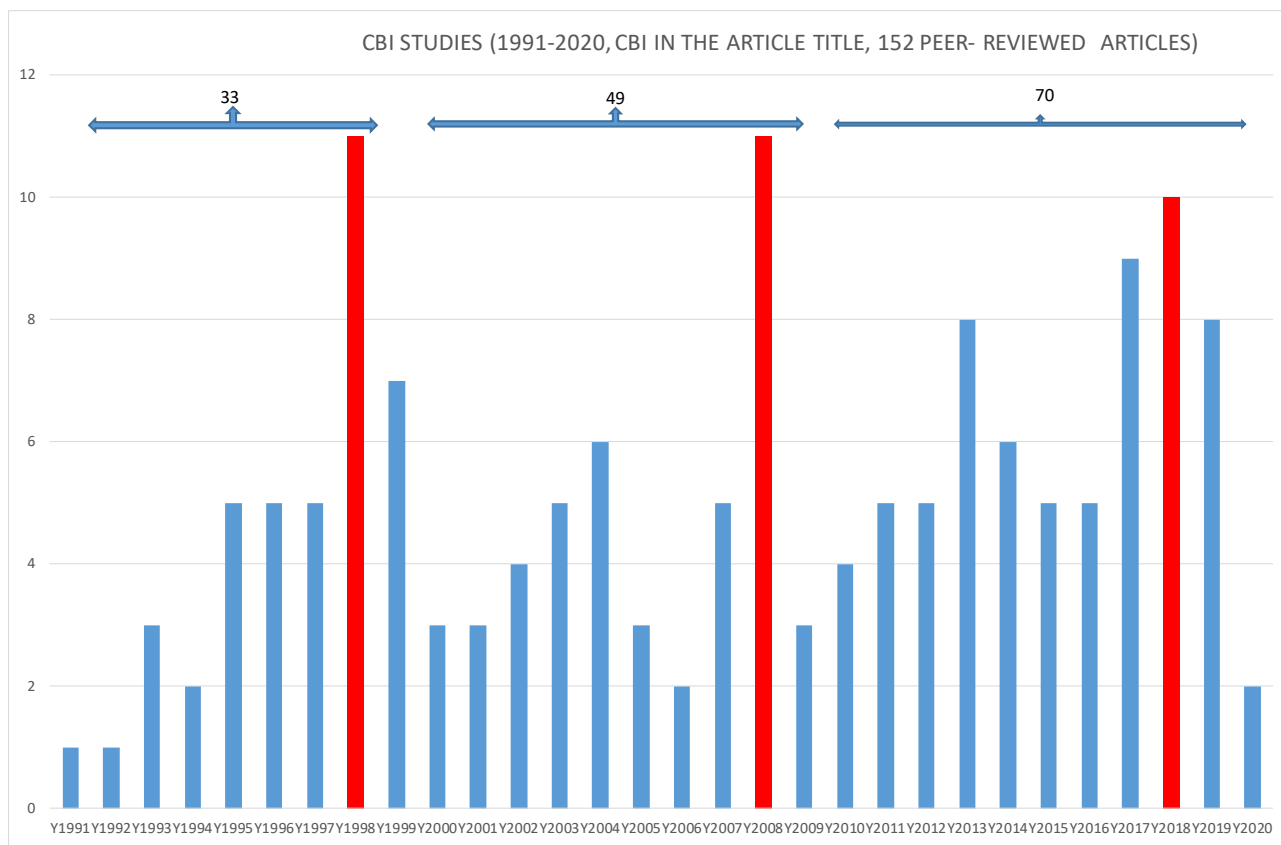
<sup>88</sup> See: Orphanides A., (2015).

<sup>89</sup> For example groupthink; See: Rybacki J., (2019).

<sup>90</sup> See: Khan A., (2018), op.cit.; in this respect and given the relationship between central banker reputation and central bank communication - Moschella and Pinto (2018) - it could be interesting to wonder if behavioral biases can matter in explaining such as relationship. On political communication –i.e. for example via tweets – and CBI see Bianchi et al. (2019), Camous and Matveev (2019).

<sup>91</sup> For example the Oversight Boards. See: Bossu W. and Rossi A., (2019).

With all these questions in mind, this article provided a critical evaluation of the state of the art and invited readers to reorient their thinking on how the monetary policy making works in practice, exploring new questions and reconsidering old ones<sup>92</sup>.



<sup>92</sup> One recent example is the question of the degree of CBI as endogenous variable. We can wonder if the political preferences of the legislatures can be influenced by the recent wave of populism. Some researchers argue that the rise of populism may negatively affect the consensus in favour of central bank independence evident from the late 1980s until the 2007-2008 Great Crisis - de Haan J. and Eijffinger S., (2017), Goodhart C.A. and Lastra R.,(2017). Empirically it has been tested the relationship between one aspect commonly attributed to populism (namely nationalism) and CBI - Agur I., (2018), Binder C.C., (2018), Bodea C. et al. (2019). For a theoretical analysis see Masciandaro and Passarelli (2019).

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